



# AEROSPACE INFORMATION REPORT

AIR1489™

REV. C

Issued 1977-04  
Revised 2012-05  
Reaffirmed 2022-09

Superseding AIR1489B

## (R) Aerospace Landing Gear Systems Terminology

### RATIONALE

AIR1489C has been reaffirmed to comply with the SAE Five-Year Review policy.

#### 1. SCOPE

This report has been compiled by the Landing Gear Systems Terminology Panel of SAE Committee A-5 (Aerospace Landing Gear Systems). It represents an effort to gather together those terms commonly used within the discipline. Some terms are of course common to other disciplines as well. Others, however, are unique in form and/or meaning to the landing gear discipline. The need has been noted to set these terms down and provide a standard definition in order that communication within the discipline may be conducted with a common understanding. Full use has been made of available published information, and a list of references is provided. See also References (a) to (e).

Terms listed are usually applicable to a general functional area of landing gear disciplines. These general functional areas include; landing impact, directional ground control, velocity control (acceleration, retardation, and arrestment), structural support, ground flotation, and ground maintenance. In the listing of terms and definitions, each term is followed by a code in parenthesis which indicates which basic functional area or major component to which the term is most applicable.

Codes indicating basic functional area or major component are as follows:

#### a. Landing Gear Systems

1. Landing Gear (General) (L/G)
2. Tire (Tire)
3. Wheel (Whl)
4. Brake (Brk)
5. Nose Wheel Steering (NWS)
6. Shock Absorber (S/A)
7. Brake Control (B/C)

SAE Executive Standards Committee Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2022 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)

Tel: +1 724-776-4970 (outside USA)

Fax: 724-776-0790

Email: [CustomerService@sae.org](mailto:CustomerService@sae.org)

SAE WEB ADDRESS:

<http://www.sae.org>

For more information on this standard, visit  
<https://www.sae.org/standards/content/AIR1489C/>

b. Related Systems

1. Air Vehicle/Aircraft (A/V)
2. Arresting Gear (A/G)
3. Operating Base & Equipment (Base)
4. Catapult (Cat)

**ABORT (A/V)** - (1) To cut short or break off an action, operation, or procedure with an aircraft, space vehicle or the like, especially because of equipment failure, as to abort a takeoff, abort a mission, or abort a launch. (2) An aircraft, space vehicle, or the like that aborts. (3) An act or instance of aborting. (4) During catapulting, the act of suspending a launch and removing the airplane from the catapult. See also BALANCED FIELD LENGTH and CRITICAL FIELD LENGTH.

**ACCELERATE - STOP DISTANCE (Base, A/V)** - A measure of the field length requirement for aircraft operation. The accelerate-stop distance is the sum of (1) the distance required to accelerate the aircraft from a standing start to the critical engine failure speed and (2) assuming the critical engine to fail at this speed, the distance required to bring the aircraft to a full stop.

**ACCELERATION (Whl, Brk, B/C, etc.)** - (1) The rate of change of velocity with respect to time (as in speed or direction). (2) The act or process of accelerating, or the state of being accelerated. Negative acceleration is called deceleration.

**ACCUMULATOR (L/G, A/G, Brk, B/C, etc.)** - A device or apparatus that accumulates or stores up, as: a contrivance in a hydraulic system that stores fluid under pressure. An accumulator can store air for emergency gear blowdown or shock strut hiking (energy). Also an electric storage battery (British).

**ACN/PCN (L/G, Base)** – The Aircraft Classification Number/Pavement Classification Number system was developed to provide a single means for reporting the aircraft weight-bearing capacities of airfield pavements for use in controlling pavement over load.

**ACTUATING SYSTEM (A/V, etc.)** - A system (mechanical, fluid, electrical, or otherwise) that supplies and transmits energy for the operation of other mechanisms or systems.

**ACTUATOR (L/G, A/G, Brk, etc.)** - A device that transmits energy and supplies force for the operation of other mechanisms or systems. It may utilize hydraulic, electrical, gaseous, or other sources of energy.

**ACTUATOR-LOCKING (L/G, etc.)** - An actuator with integral provisions for locking the output rod or shaft in a given position or positions.

**ADAPTIVE CONTROL SYSTEM (B/C, L/G, SA)** - Also active control. A control system which continuously monitors the dynamic response of the controlled system and automatically adjusts critical system parameters to satisfy the preassigned response criteria, thus producing the same response over a wide range of environmental conditions.

**AERODYNAMIC COEFFICIENT (A/V)** - Any nondimensional coefficient relating to aerodynamic forces or moments, such as a coefficient of drag, a coefficient of lift, etc.

**AERODYNAMIC FORCE (A/V, etc.)** - The force exerted due to the relative motion between a gaseous fluid and a body completely immersed in it.

**AIRFIELD, EXPEDITIONARY, (Base)** - The Expeditionary Airfield (EAF) is an on-shore, aviation weapons support system which permits deployment of land based aircraft within effective range of ground forces. Although an EAF can be as basic as a grass landing zone (LZ) to support helicopter operations, the installation of one or more EAF subsystems adds versatility and/or durability to the site selected for aircraft operations. See also SATS.

**AIRFIELD, FORWARD-AREA (Base)** - Airfields that must support the operation of liaison, observation, and light transport type aircraft, including heavy cargo helicopters, for a period ranging from a few days to three weeks. Airfields of this class will be constructed by engineer combat and airborne battalions, and usually will be located in the Division area of a combat zone. The strength characteristics of the forward-area airfield will normally govern the landing gear flotation design for any fixed-wing aircraft or heavy cargo helicopter with a mission requirement to operate in a near-front-line unit (for example, the retail delivery mission in an Air Line of Communications). The controlling forward area airfield is characterized as a field having a 4-CBR subgrade with no structural surfacing. It should be noted that an aircraft having sufficient flotation to operate on a 4-CBR subgrade for the number of design operations will have the capability of operating a lesser number of times on subgrade strengths substantially below 4 CBR. (TO - Theater of Operations)

**AIRFIELD, HEAVY-LOAD (Base)** - An airfield that must support heavy bomber type aircraft. The load-carrying capacity of pavements for this type of airfield is equivalent to a main gear load of 265 000 lb on a four-wheel, dual-twin configuration having tire contact areas of 267 in<sup>2</sup> for each wheel, twin spacing of 37 in center-to-center (c-c), and inside wheels of twins spaced 62 in c-c. (ZI - Zone of the Interior)

**AIRFIELD, LIGHT-LOAD (Base)** - An airfield that must support fighter and medium cargo type aircraft. The load-carrying capacity of pavements for this type of airfield is equivalent to a main gear load of 25 000 lb on a single wheel having a tire contact area of 100 in<sup>2</sup>.

**AIRFIELD, MEDIUM-LOAD (Base)** - An airfield that must support heavy cargo, tanker, and medium bomber type aircraft. The load-carrying capacity of pavements for this type of airfield is equivalent to a main gear load of 100 000 lb on a two-wheel, twin configuration having tire contact areas of 267 in<sup>2</sup> for each wheel and wheel spacing of 37 in c-c.

**AIRFIELD, REAR-AREA (Base)** - Airfields that normally must support the operation of heavy cargo aircraft, medium cargo aircraft, and fighter-bomber aircraft for a period of four to six months. Airfields of this class will be constructed, rehabilitated, extended, and maintained by engineer construction battalions and will usually be located in the Zone of Communications or in the Army rear area. The strength characteristics of the rear-area airfield will normally govern the landing gear flotation design for heavy cargo and fighter-bomber aircraft. The controlling rear-area airfield is characterized as a field having the equivalent of a T11 landing mat surface lying directly on a 4-CBR subgrade.

**AIRFIELD, SUPPORT-AREA (Base)** - Airfields that normally must support the operation of medium cargo aircraft (and conceivably certain fighter-bomber aircraft designed for close tactical support) for a period of two weeks to one month. Airfields of this class may be constructed by several types of engineer units including engineer construction battalions, engineer combat battalions, and engineer airborne battalions and light equipment companies, and will usually be located in the Corps forward or Division rear area. The strength characteristics of the support-area airfield will normally govern the landing gear flotation design for medium cargo aircraft with such typical missions as the bulk delivery of supplies to Corps and Division forces in an intra-theater Air Line of Communications. The controlling support area airfield is characterized as a field having the equivalent of an M8 landing mat surface lying directly on a 4-CBR subgrade.

**AIRFIELD, THEATER OF OPERATIONS (Base)** - Theater-of-Operations airfields (more specifically TO airfield types) are limited-life facilities which represent the maximum construction capability of engineer troop units in the field, considering time limitations imposed by the tactical situation and available construction equipment and surfacing materials. The TO airfield classes are defined as rear-area, support-area, and forward-area airfields, and light VTOL landing areas.

**AIRFIELD, ZONE OF INTERIOR (Base)** - Zone-of-Interior airfields are permanent facilities constructed in accordance with the criteria given in Air Force Manual 88-6. Pavements may be either rigid (concrete); flexible (bituminous), or a combination thereof. The ZI airfield classes, as defined for Air Force construction, not only represent a range of flotation capabilities but also directly represent the designs on which most existing military airfields are based. Thus, the relations presented have a direct application to existing airfields in addition to providing a basis for comparison of proposed new aircraft landing gear designs with those of existing aircraft. The ZI airfield classes are defined as heavy-load, medium-load, or light-load airfields.

ALIGHTING GEAR (L/G) - A general term which includes all equipment or components concerned with alighting on or landing on water, land, shipboard or elsewhere, i.e., wheels, shock struts, floats, skis, etc. See also LANDING GEAR.

ALIGNING TORQUE (Tires) or Self-Aligning Torque - The footprint torque which in a rolling tire resists rolling in a curvilinear path, i.e., tends to align the roll into a straight path.

ANGULAR VELOCITY (Whl, etc.) - The change of angle per unit time; specifically the change in angle of the radius vector per unit time.

AQUAPLANE (Tire, A/V) - See HYDROPLANE.

ANGLE OF CORD (Tires) - The angle at which the cords in adjacent layers of fabric are set in the body or carcass of a tire relative to the centerline of the tread.

ANTISKID CONTROL (B/C, A/V) - A group of interconnected components which interact to reduce excessive brake pressure (hydraulic brake system) or clamping force (electrical brake system) and thus prevent inadvertent or excessive tire skidding thereby contributing to shorter aircraft stopping distances. See also SKID CONTROL SYSTEM.

AREA, LIGHT VTOL LANDING (Theater of Operations) (Base) - This is a special category landing area which will normally require no construction effort other than the clearing of vegetation. It will be characterized as an area having a non-surfaced, 1-1/2 CBR subgrade and will permit one to three operations of aircraft, such as personnel transport helicopters, on ground which, while having the minimum strength required for operation of most common military types of wheeled ground vehicles, can support these vehicles without significant danger of immobilization. It should be noted that the type of aircraft using this landing area will be capable of repeated operation from areas having greater than 1-1/2 CBR strength.

ARMING (B/C) - Provision of pre-setting a skid control function such as touchdown protection by some specific operating sequence of the aircraft (i.e., gear retraction/extension, squat switch activation, etc.). Term may also be applied to systems other than skid control.

ARRESTING CABLE (Base) - A wire rope which is stretched across a deck or runway, and which is engaged by the aircraft arresting hook to decelerate the aircraft. Also called cross deck pendant. See also ARRESTING GEAR.

ARRESTING GEAR (Shipboard and Field) (Base, A/G) - Any gear or apparatus designed to arrest something in its motion either all or part of such gear being external to the object being arrested. Specifically, any such apparatus used (i.e., in carrier landings) to arrest airplanes in the landing roll. "Arresting gear in its commonest form comprises a wire rope (arresting wire, arresting cable, cross deck pendant), or the like, stretched across the deck or runway in the path of the airplane and which engages the airplane arresting hook; and energy absorbing devices (arresting engine). In lieu of the wire rope/arresting hook system, a webbing assembly is sometimes used to engage the airframe and/or the landing gear, usually in emergency circumstances." See BARRIER, BARRICADE. Also see Reference (f).

ARRESTING HOOK (A/G) - The hook assembly, usually mounted on the aircraft for the purpose of engaging arresting gear mounted on the deck or runway for deceleration (arrestment) of the aircraft. The hook assembly consists of the shank (usually a V, Y or single "stinger" arrangement) and a hook point, usually detachable. The arresting hook installation in the airplane usually consists of the hook assembly, the holdown damper (dashpot, snubber), the holdown accumulator and pressure gauge(s), the extend/retract actuator (sometimes combined with the dashpot), the centering spring or similar device, the uplatch mechanism, the cockpit controls, and any related linkages, mechanisms, and fairings. See TAIL HOOK. Also see References (g) and (i).

ARRESTING WIRE (Base, A/G) - See ARRESTING CABLE.

ARTICULATED (L/G) - On a landing gear, an arrangement where the gear is hinged to permit folding as desired for retraction or operation, i.e., articulated axle. See Figure 1.

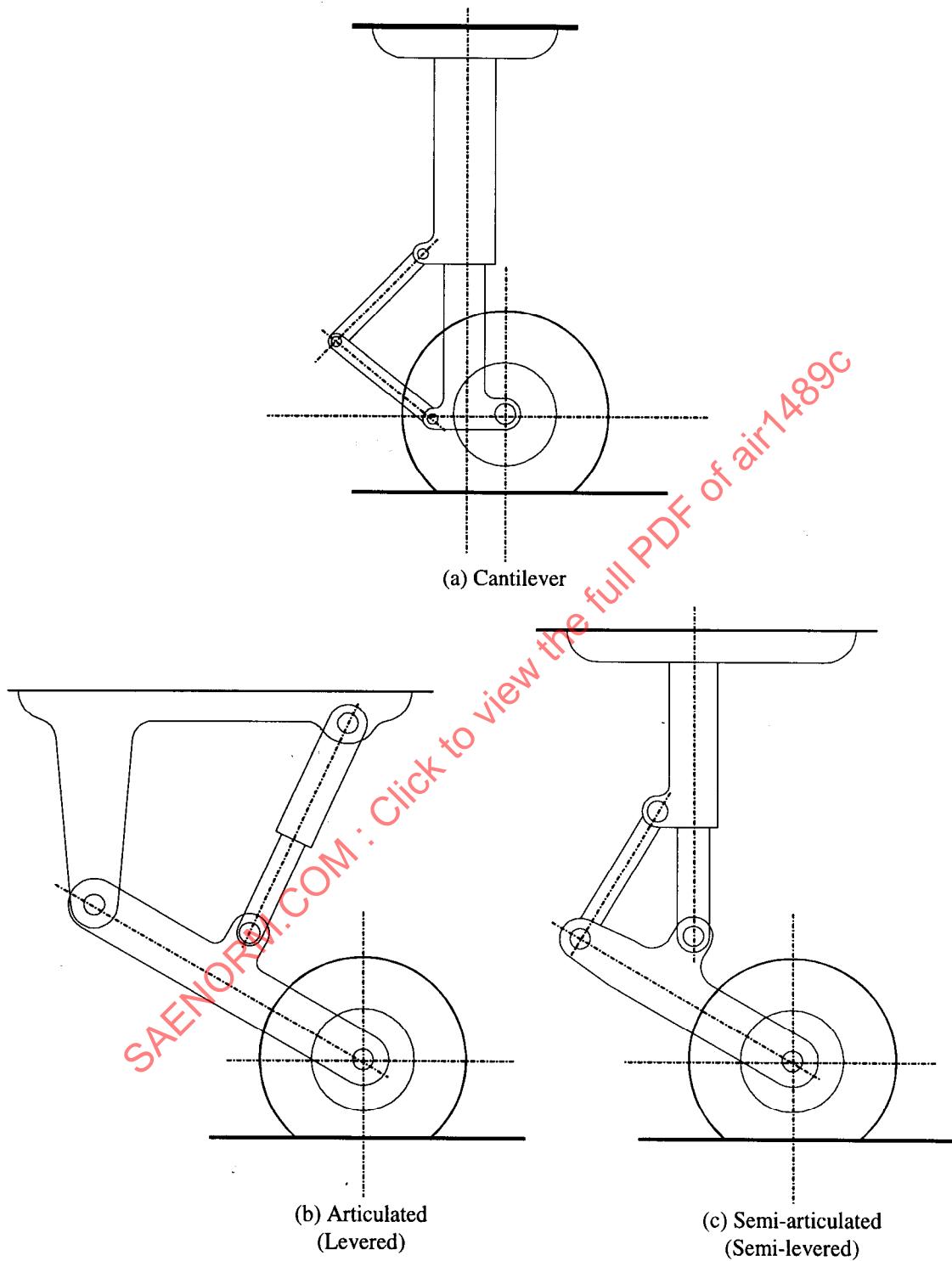


FIGURE 1 - LANDING GEAR ARRANGEMENT SCHEMATICS

ASPECT RATIO (Tires) - Ratio of tire section height to section width. General category: Low aspect ratio equal to or less than 0.77.

ASSEMBLY LOAD (L/G) - The total load imposed upon one gear assembly, i.e., one main gear assembly. Also called post load or ground load.

ATO (ABORTED TAKEOFF) (A/V) - See ABORT and REJECTED TAKEOFF.

ATO (Assisted Takeoff) (A/V) - A procedure in which an assist is utilized for takeoff operation such as rocket assist (RATO) or jet assist (JATO). A catapult (shipboard and shorebased) is a launching device which can be reused repeatedly and rapidly to provide takeoff assistance.

AXLE (L/G) - A supporting shaft upon which a wheel turns or which provides support for a rotating member.

AXLE BASE (L/G) - The dimension between axle centerlines on a multiple axle landing gear.

AXLE BEAM (L/G) - The structural member which connects and supports axles on a multiple axle gear arrangement. Also called bogie beam or truck beam.

AXLE SLEEVE (L/G) - A tubular sleeve which fits over the axle and supports the wheel bearings. Function includes (a) protection of the axle from galling or damage from bearing races, and (b) permitting wheel tire assembly buildup and torque adjustment in the shop and therefore protecting against sand, dust, and foreign object damage during installation on the aircraft. Also called false axle and bearing can.

BACKLASH (L/G, etc.) - In an aircraft control system, a looseness or free play in the linkage between crew station controls (input) and the device being controlled (output). In a landing gear system, similarly, any looseness, free play or slop in the system, i.e., nose wheel steering backlash/free play.

BACK PRESSURE (A/V, Brk, etc.) - Pressure exerted backward; in a field of fluid flow, a pressure exerted contrary to the pressure producing the main flow, i.e., brake back pressure. Net operating pressure is equivalent to gross system pressure less back pressure and other mechanical losses. Also refers to residual system pressure which the brake return mechanism must overcome or react against when a brake off command is executed.

BACKUP (L/G, etc.) - An item or system kept available to replace a primary item or system and to perform the same function of the primary item or system in the event that the primary equipment fails, i.e., a backup gear extension system.

BALANCED FIELD LENGTH (Base) - Any airfield where the actual field length is equal to the critical field length is designated a Balanced Field Length. See CRITICAL FIELD LENGTH.

BARRIER, MID-FIELD (Base) - A type of arresting gear located at the mid-point of the runway to decelerate and stop an aircraft. May be utilized as the aircraft lands in either direction on the runway.

BARRIER, OVERRUN (Base, A/G) - A type of arresting gear located near the end of a runway to decelerate and stop an aircraft in case of brake system or other failure. Generally an overrun area is provided off the end of the runway for runout.

BARRIER, POP-UP (Base, A/G) - A type of arresting gear designed such that for normal operations, the aircraft rolls over the barrier. As an emergency requires and a command signal is given, the barrier pops up into a position for engagement prior to the aircraft pass.

BARRICADE (Base, A/G) - Similar to barrier; for deceleration and recovery of an airplane with a known landing emergency. Generally a strap or webbing arrangement connected to an energy absorbing system. Whereas a barrier often is designed to engage an airplane landing gear, a barricade primarily is designed to engage the wings and other airframe structure, but may also engage the landing gear.

BEACHING GEAR (A/V, Base) - Any wheeled device attached to a seaplane or flying boat to permit moving it onto the beach or shore and to move the aircraft about ashore. May be removed during normal operations and attached for beaching operations.

BEAD (Tire) - Layers of wire, usually steel, imbedded in rubber and wrapped with fabric. They give a base around which the plies are anchored and provide a firm fit on the wheel. To provide increased stiffness in this area, "flippers" are then sometimes wrapped around the enclosed beads. Beads restrict air pressure expansion of the tire and jumping off the bead seat of the wheel. This term may also be properly applied to the entire zone of the tire in contact with the wheel rim. See Figure 2.

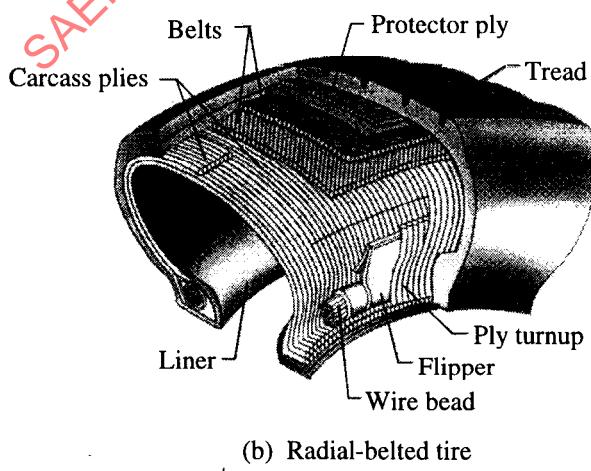
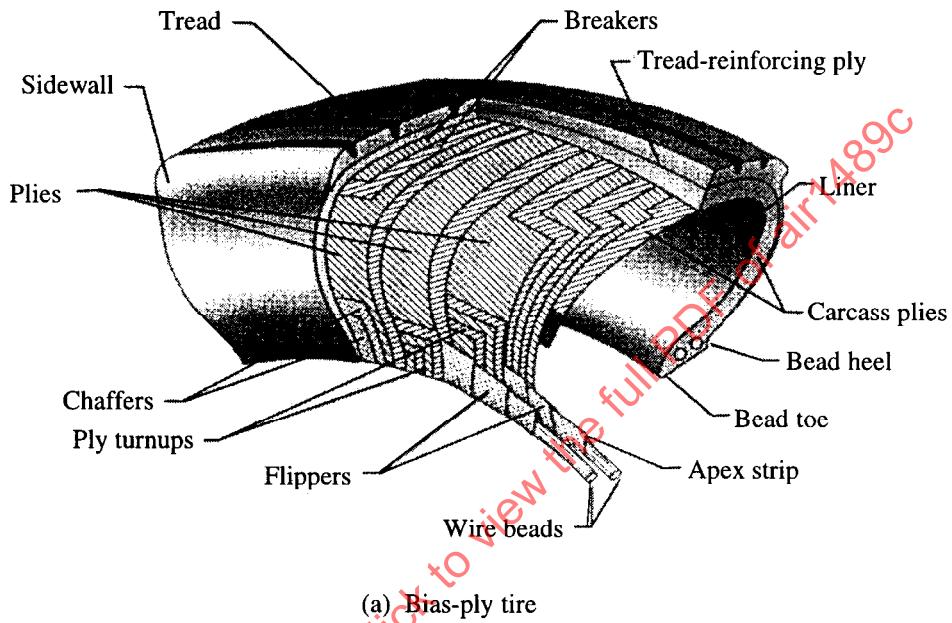


FIGURE 2 - AIRCRAFT TIRE CONSTRUCTION

BEAD BUNDLE (Tire) - The bead wires wrapped together to form the tire bead.

BEAD HEEL (Tire) - The outer bead edge which fits against the wheel flange.

BEAD TOE (Tire) - The inner bead edge closest to the tire centerline.

BEAD WIRE (Tire) - The steel wire from which the tire beads are wound.

BEARING CAN (Whl) - See AXLE SLEEVE.

BIAS-PLY (Tire) - Pneumatic tire in which the ply cords are laid at alternate angles substantially less than 90 degrees relative to the centerline of the tread. See Figure 2.

BLOW DOWN (L/G) - An emergency extension of the landing gear using an air charge in the event of hydraulic failure when the gear does not have free fall capability through the air stream.

BOGIE (L/G) - A low, strongly built cart. In landing gear usage, two or more wheels or sets of wheels on axles connected by means of an axle beam (or bogie beam) pivoted at the lower end of a shock strut assembly or structure to permit pitching motion as it rides over the runway or other supporting surface.

BOGIE BEAM (L/G) - See AXLE BEAM.

BOGIE GEAR (L/G) - A type of landing gear configuration utilizing a shock strut or structural support assembly and at the lower end, a pivoted bogie assembly.

BOLTER (A/V) - An attempted arrested landing wherein (1) the arresting hook fails to engage the arresting wire due to hook skip, (2) the aircraft touches down beyond the wire area, (3) the arresting hook fails to retain the wire, or (4) the arresting hook or wire fails after engagement. The aircraft then becomes airborne and resumes normal flight.

BOUNCE, AIRCRAFT (L/G, B/C) - A vertical motion of the entire aircraft during the landing transient before full and stable weight on wheels is achieved. See REBOUND.

BRACE (L/G) - See DRAG BRACE, JURY BRACE, SIDE BRACE, etc.

BRAKE, ANNULAR PISTON (Brk) - A type of brake using an annular or ring shaped piston/cylinder arrangement and powered by hydraulic or air pressure to apply force for squeezing a set of alternate rotating/stationary discs together to produce torque and a decelerating force.

BRAKE BACK PLATE (Brk) - The structural end plate on a multiple disc brake opposite the actuators. Its purpose is to restrain the discs and resist the force exerted by the actuators.

BRAKE BY WIRE (A/V, B/C) - A braking system in which hydraulic brakes or electromechanical brakes are applied via electrical signals rather than a mechanical connection.

BRAKE CARRIER (Brk) - See BRAKE HOUSING.

BRAKE CHATTER (Brk) - A self-induced brake vibration of less than 100 cps, excited by the friction characteristics of the rubbing surfaces. This vibration is characterized as a torsional oscillation of the wheel and/or brake rotors against the elasticity of the tire and is sometimes referred to as wheel chatter.

BRAKE CONTROL SYSTEM (A/V, Brk, B/C) - The total system for control of a brake or brakes. May be a mechanical system, hydraulic system, electrical/electronic system, etc., but generally includes a combination of types i.e., mechanical pilot input to brake pedals, mechanically or hydraulically actuated hydraulic system to the brakes, electrically actuated hydraulic system to the brakes, or electrically actuated brakes all controlled by an electronic/mechanical controller.

**BRAKE CURRENT (Brk)** – Brake current is the electrical current drawn by an electrically actuated brake assembly.

**BRAKE DESIGN LANDING LOAD (Brk)** – The brake design landing load is the average of the 100 peak clamping loads generated in the electrically actuated brake assembly during the design landing stop test as determined by test or analysis of test results.

**BRAKE DISC (Brk)** - A single disc of a brake. May be a rotating disc (rotor) in a single or multiple disc brake or stationary disc (stator) in a multiple disc brake. Functions in a heat absorbing capacity and to produce a frictional retarding force. May be a solid disc or an assembly of segments.

**BRAKE, DISC (Brk)** - A type of brake utilizing one or more rotating discs with a clamping force applied to produce a frictional retarding force.

**BRAKE DISPLACEMENT (Brk)** - The volumetric displacement required in a brake actuation system to actuate from full off to full on.

**BRAKE DRAG (Brk)** - Any residual resistance to motion produced by a brake assembly when in the full off condition.

**BRAKE DRAG FORCE (Brk)** - Any resistance to motion produced by a brake assembly. May apply to an on or off condition but generally considered as the decelerating force produced by the brake when powered to on condition.

**BRAKE DRUM (Brk)** - Cylindrical, rotating part fastened to the wheel. Acts as a friction surface, a heat sink, and to transmit torque.

**BRAKE, DRUM (Brk)** - A type of brake utilizing a brake drum and brake shoe or expander tube arrangement.

**BRAKE ENERGY (KINETIC ENERGY) (Brk)** - The portion of the energy due to the motion of the vehicle mass and the residual engine thrust which must be converted by the brake assembly to some other form of energy and either dissipated or absorbed.

**BRAKE, EXPANDER TUBE (Brk)** - A drum type brake using a rubber-like tube to expand and press the brake lining segments against the friction surface of the drum.

**BRAKE HORSEPOWER (Brk)** - The horsepower (time rate of doing work) delivered by the brake.

**BRAKE HOUSING (Brk)** - The brake part which contains hydraulic or pneumatic fluid passages and the actuating pistons and cylinders. For an electric brake, it would house the actuating motors, gear assemblies, and pistons. Also called brake carrier, power plate, actuator housing.

**BRAKE LINING (Brk)** - Individual blocks of wearable material, discs that have wearable material integrally bonded to them, or discs in which the wearable material is an integral part of the disc structure.

**BRAKE LINKAGE (A/V, Brk)** - Links or levers, or structural members used to connect an axle mounted, free rotating brake assembly to the fixed structure of the gear. Also a linkage system for the purpose of actuating a brake assembly.

**BRAKE LOAD (Brk)** – Brake load is the clamping load the brake (typically an electric brake) is designed to generate.

**BRAKE MASTER CYLINDER (A/V, Brk)** - In a fluid operated brake system, the cylinder assembly which receives an input command force and in turn transmits a fluid (hydraulic/pneumatic) force to one or more actuating cylinders, usually located at or on the individual brake assemblies.

**BRAKE PRESSURE METERING VALVE (A/V, Brk)** - A fluid metering valve in the brake control system that distributes the proper fluid pressure and flow in proportion to the mechanical and/or electrical inputs from the brake pedals to the brake.

BRAKE, MULTIPLE DISC (Brk) - A brake assembly utilizing many alternate rotating and stationary discs (rotors and stators).

BRAKE, MULTIPLE PISTON (Brk) - A brake configuration utilizing two or more actuating cylinders and pistons, interconnected and circumferentially spaced around the brake housing.

BRAKE OVERHEAT INDICATOR (A/V, Brk) - A device or system for the purpose of detecting and indicating to the pilot that an overheat condition exists in the brakes, i.e., caution and/or warning.

BRAKE OFF POSITION (Brk) – Brake Off Position (BOP) is a retracted EMA position that permits free rotation of the wheel and brake assembly after a brake application and release cycle. See EMA

BRAKE PRESSURE PLATE (Brk) - A stationary disc with a prescribed cross-section used to distribute the applied piston actuating loads or forces to the brake discs. Also called primary disc, retractor plate.

BRAKE RATED WEAR LIMIT (Brk) - BRWL is the brake maximum wear limit used in the Accelerate-Stop Test and the Most Severe Landing Stop Test for electrically actuated brakes.

BRAKE ROD (Brk) - That part of the brake linkage connecting the brake housing to the inner cylinder or gear part to take out the torque.

BRAKE ROTOR (Brk) - Rotating disc. A part normally keyed to the wheel and rotating with it relative to the fixed axle.

BRAKE SHOE (Brk) - A structural part of the brake assembly which is actuated by the system force input and which presses the brake lining against the rotating brake drum.

BRAKE, SINGLE DISC (Brk) - A brake configuration utilizing a single rotating disc.

BRAKE STATOR (Brk) - Stationary disc. A part normally keyed to a stationary part of the brake assembly.

BRAKE, SPOT TYPE (Brk) - A brake configuration utilizing a single cylinder and piston arrangement with a "spot" type lining to rub against the rotating disc.

BRAKE SQUEAL (Brk) - A self-induced brake vibration mode with a frequency greater than 100 cps. This vibration mode is characterized by torsional oscillation of the non-rotating parts of the brake assembly against the elastic restraint of the torque takeout or brake rod linkage.

BRAKE SYSTEM CURRENT (Brk, B/C) – Brake system current is the electrical current available to the EMA by the brake control system. See EMA, Brake Current.

BRAKE SYSTEM POWER (Brk, B/C, A/V) – Brake system power is the electrical power that is available to the brake assembly by the brake control system. See EMA, EMA Brake Power.

BRAKE SYSTEM VOLTAGE (Brk, B/C) – Brake system voltage is the electrical voltage that is available to be delivered to the brake assembly from the aircraft brake control system. See EMA, EMA brake Voltage.

BRAKE TORQUE (Brk) - The torque developed by the friction elements of the brake assembly. This torque is transmitted through the wheel and tire where it is reacted by a drag force at the tire/runway interface. Other resultant forces are reacted by the aircraft structure. See also BRAKE TORQUE COMPENSATING LINKAGE.

BRAKE TORQUE COMPENSATING LINKAGE (Brk) - A mechanical linkage for the purpose of transmitting brake torque reaction loads to the fixed structure of a landing gear, especially in a bogie type landing gear configuration where brake drag loads reacted at the tire/runway interface would cause excessive pitching of the bogie assembly if uncompensated with the linkage to fixed gear structure. The linkage system may also contain hydromechanical and/or automatic electronic control elements. Also called Brake Torque Reaction Linkage.

**BRAKE TORQUE TUBE (Brk)** - A tubular shaped part of the brake assembly which fits around the axle and to which the stators (stationary discs) are keyed. The torque tube transmits the stator torque to the brake housing and/or other fixed brake structure, and to the axle, compensating linkage, or gear structure.

**BRAKE WHIRL (Brk)** - Rotating bending motion of the brake and axle, associated with angular misalignment between stators and rotors and with circumferentially non-uniform contact pressure distribution.

**BRAKED ROLL (A/V)** - The portion of an aircraft landing roll during which the brakes are applied for deceleration of the vehicle.

**BRAKING, ANTISKID (A/V, B/C, Brk)** - The process of braking an aircraft and utilizing an antiskid system as an integral part of the brake control system.

**BRAKING, AUTOMATIC (A/V, Brk)** - Control of aircraft braking with an automatic system and the pilot out of the control loop. An input of the desired rate of deceleration is made prior to landing. The system generally includes an antiskid system and manual selection of a deceleration rate. Eliminates pilot technique during the braked roll.

**BRIDLE, CATAPULT (Base, Cat)** - A wire rope or synthetic fiber assembly designed to connect an aircraft to a catapult for the purpose of accelerating the aircraft for takeoff. The bridle connects to two catapult hooks on the aircraft and passes around the catapult shuttle spreader. The bridle falls off the aircraft (sheds) as it overtakes the shuttle and is generally restrained by a bridle arrestor system on the deck. Now obsolete in the U.S. Navy due to conversion to nose gear launch system, but may be still in use in some foreign navies. See also PENDANT, CATAPULT.

**BUFFER, CATAPULT (Base, Cat)** - In nose gear catapulting, a device or system for decelerating the aircraft to zero velocity at hookup condition by the engagement of the holdback bar with the slider of the catapult deck hardware.

**BUNGEE (L/G)** - A spring, elastic cord, or other tension (or compression) device used in a system to balance an opposing force or in a landing gear system to assist in retracting or extending the gear or to absorb shock, etc., i.e., downlock bungee, uplock bungee, overcenter bungee, etc. Also known as shock cord.

**BURST PRESSURE (Tire, Whl, Brk, etc.)** - The pressure required to rupture or burst. Generally a design includes allowance for maximum expected pressure in service multiplied by a reasonable safety factor.

**CBR (CALIFORNIA BEARING RATIO) (Base)** - A measure of the bearing capacity of soil. The CBR of a soil is expressed in terms of a percentage of the bearing capacity of a standard crushed limestone surface (100).

**CALIPER, BRAKE (Brk)** - A "C" shaped structural part of a brake assembly which fits around the edge and adjacent to both sides of the rotating disc. The caliper contains an actuator(s) to provide a force against the rotating disc to produce the decelerating force.

**CAMBER (Whl, Tire)** - The angle which the plane of a wheel or tire makes with a plane normal to the ground. Usually considered positive when the angle vector moves up and outboard relative to the centerline of the vehicle.

**CANTILEVER LANDING GEAR (L/G)** - Landing gear arrangement in which the axle is attached to the lower piston, and the piston slides inside the outer cylinder. A torque arm scissors linkage restricts the travel of the piston in rotation relative to the outer cylinder and limits the piston telescoping travel. See Figure 1.

**CARCASS (Tire)** - The structural body of a tire. Generally would include all tire components except the tread.

**CASING (Tire)** - Structural part of a tire. See also CARCASS.

**CASTER (Whl, Tire)** - To swivel about an eccentric vertical axis. Also the dimension which defines this characteristic, i.e., distance from the point where the swivel axis intersects the ground and the centroid of the tire contact area. Generally considered positive when the tire centroid point falls aft of the swivel axis intersect point. Also called castor. See also TRAIL.

CASTERING GEAR (L/G) - A gear configuration which has a designed-in capability to caster such as a nose gear or tail gear. See also CROSS WIND GEAR.

CATAPULT (Base, Cat) - A device or machine used to accelerate an airplane to takeoff speed. The capability for rapid and repeated re-use distinguishes it from rocket or JATO assisted takeoff devices. Also, a device (usually explosive) for ejecting a person from an aircraft. Also, a device used to eject crash locator radios from an aircraft.

CATAPULT BRIDLE (Base, Cat) - See BRIDLE.

CATAPULT HOOK (A/V) - A hook or hooks built into an aircraft for the purpose of engaging the pendent or bridle used to connect the aircraft to the catapult shuttle spreader. Now obsolete in the U.S. Navy due to conversion to the nose gear launch system, but may be still in use in some foreign navies.

CATAPULT SHUTTLE (Base, Cat) - The deck-mounted or field-mounted arrangement or device for the purpose of towing the aircraft for catapulting. Usually includes an inverted hook (spreader) for engagement with the catapult launching bridle, pendant, or launch bar.

CENTRIFUGAL FORCE (Whl, Tire, etc.) - The apparent force in a rotating system, deflecting masses radially outward from the axis of rotation, with magnitude per unit mass  $\omega^2 R$  where  $\omega$  is the angular speed of rotation, and  $R$  is the radius of curvature of the path. This magnitude may also be written  $V^2/R$  in terms of the linear speed  $V$ . This force (per unit mass) is equal and opposite to the centripetal acceleration.

CENTRIFUGAL GROWTH (Tire) - The growth in diameter of a rotating tire due to centrifugal force.

CHAFER STRIP (Tire) - The strips of rubber coated fabric which reinforce the bead area and protect the carcass plies against wheel chafing and against damage when mounting or demounting the tire.

CHUTE, DECELERATION (A/V) - See CHUTE, DRAG.

CHUTE, DRAG (A/V) - A parachute attached to an aircraft and deployed usually after touchdown for the purpose of decelerating the aircraft by means of aerodynamic drag.

CHUTE, DROGUE (A/V) - A parachute deployed for the purpose of providing the necessary force for extracting and deploying a main drag chute or chutes.

CHUTE, PILOT (A/V) - A parachute deployed to initiate a sequence of events in a drag chute system; i.e., the pilot chute is mechanically (or otherwise) ejected into the airstream. The pilot chute provides enough drag to pull the drogue chute which in turn provides adequate power to extract and deploy the main chute(s).

CLEARANCE, BRAKE RUNNING (Brk) - The clearance provided in a brake assembly in the "full off" condition between the actuators and the pressure plate or between the pressure plate and adjacent rotor, i.e., the actuator travel required from "full off" to initial application of force to the friction surfaces.

CLEARANCE, LATERAL (Whl, Tire, etc.) - The clearance provided at the side of a wheel or tire to insure against interference during rotation and/or variations in a predetermined location, i.e., deflections, lateral runout, looseness in the system, etc.

CLEARANCE, RADIAL (Tire, Whl, etc.) - The clearance provided radially to insure against interference during rotation and/or variations in a predetermined location. Tire radial clearance should include allowances for new tire growth due to pressure, service relaxation, and centrifugal growth.

CLOSED LOOP SYSTEM (B/C, etc.) - A system in which the output is used to control the input. See feedback control loop.

COD (CARRIER ONBOARD DELIVERY) (Base) - Operation involving aircraft delivery of personnel or material on board an aircraft carrier.

COEFFICIENT OF FRICTION (Tire, etc.) - A number indicating the amount of some change under certain specified conditions, often expressed as a ratio. Specifically, coefficient of friction is the ratio of the available tangential force at a common boundary of two bodies (i.e., tire and runway) in contact that can resist the motion or tendency to motion of one relative to the other to the normal force acting on the two bodies at that boundary. (Commonly denoted by  $\mu$  or  $\mu_c$ .)

COEFFICIENT OF FRICTION, EFFECTIVE (Tire, etc.) - The net effective value for coefficient of friction within a specified operating range (i.e., of velocity, temperature, etc.).

COEFFICIENT, SIDE FRICTION (Tire) - Coefficient of friction in a lateral direction for a tire. (May be affected by tread pattern.)

COEFFICIENT OF FRICTION, MAXIMUM INSTANTANEOUS (Tire) - A peak value for coefficient of friction which usually can not be sustained over a period of time.

COMMAND (B/C, etc.) - A signal or input whereby functions are performed as the result of a transmitted signal.

COMMAND CONTROL (B/C, etc.) - A system whereby functions are performed as a result of a transmitted signal

COMPENSATOR (L/G, Brk, etc.) - A device which compensates, makes up for, or offsets. For example a hydraulic pressure compensator (nose wheel steering system, etc.) which would maintain a positive pressure on the unit in case of loss of system pressure. Device may also be of mechanical or electrical design.

CONTACT AREA (Tire) - The area of a loaded tire which is actually in contact with the supporting surface. Generally elliptical in shape.

CORD BODY (Tire) - The main body of the tire which includes layer(s) of cord fabric (plies).

CORD FABRIC (Tire) - The fabric from which the plies, breakers, and chafer strips are made. May be rayon, nylon, fiberglass, etc.

CORNERING FORCE (Tire) - Lateral force of a tire perpendicular to the direction of motion at a given yaw angle.

CORNERING POWER (Tire) - The initial slope of the curve of cornering force versus yaw angle.

COROTATING (Whl) - See WHEELS, COROTATING.

COULOMB DAMPING (L/G, etc.) - The dissipation of energy that occurs when a particle in a vibrating system is resisted by a force whose magnitude is a constant independent of displacement and velocity, and whose direction is opposite to the direction of the velocity of the particle. Also called dry friction damping.

COUPLED (Brk, Whl) - A vibration term referring to the vibration frequency, damping, and mode shape of a component when affected by other components in the system. See also WHEELS.

COUPLING (B/C, Whl, etc.) - (1) A device or contrivance for joining adjacent ends or parts of anything. (2) A device permitting transfer of energy from one electrical circuit to another, or from one mechanical device to another.

COVERAGE (Base) - The number of passes of loaded tires of an aircraft in adjacent tire paths sufficient to just cover a given width of pavement one time. Determining factors are: width of traffic lane, number of wheels, width of tire contact area, and the traffic distribution. Also called Load Repetition Factor.

CRITICAL DAMPING (L/G, etc.) - The minimum damping that will allow a displaced system to return to its initial position without oscillation.

CRITICAL ENGINE FAILURE SPEED (A/V) - A minimum speed at which it is considered safe to attempt to complete the takeoff with one engine inoperative.

**CRITICAL FIELD LENGTH (Base)** - Critical Field Length is the length of field (runway) required to accelerate an aircraft to the critical engine failure speed, experience failure of the critical engine, and either (1) continue takeoff and have just enough runway left to execute a safe takeoff, or (2) elect to reject the takeoff and be able to stop the aircraft exactly at the end of the runway.

**CRITICAL SPEED (Whl, Tire, etc.)** - A speed of a rotating system that corresponds to a resonance frequency of the system.

**CROSS WIND GEAR (L/G)** - A landing gear configuration which permits alignment of the wheels to compensate for crab angle of the aircraft (due to crosswinds) at touchdown and for rollout. A fixed angle may be set in to the gear or freedom to caster and align with the direction of aircraft travel may be utilized.

**CURED ANGLE (Tire)** - The angle at which the cords are set in the tire after cure. In practice it may be measured from centerline of axle or from the plane of symmetry.

**CURED END COUNT (Tire)** - Cords per inch in the tire ply fabric after cure.

**CYCLE, GEAR EXTENSION (L/G)** - In a retractable landing gear system, the transition cycle from the up and locked (stowed) position to the down and locked (extended) position.

**CYCLE, GEAR RETRACTION (L/G)** - In a retractable landing gear system, the transition cycle from the gear down and locked (extended) position to the up and locked (stowed) position.

**CYLINDER, LANDING GEAR (L/G)** - A tubular structural member which houses the piston, orifice, oil, gas, and other elements of an air-oil shock absorber or the mechanical elements of a mechanical system. Carries lugs and/or provisions for various attachments on the exterior.

**DAMP (L/G, etc.)** - To suppress oscillations or disturbances.

**DAMPER (L/G, etc.)** - A device or system for the purpose of suppressing oscillations or disturbances. May be hydraulic or mechanical. Also British term for shock absorber.

**DAMPER, DRAG (L/G)** - A damper for the purpose of retarding drag forces. Sometimes built into a landing gear drag strut.

**DAMPER, HOP (L/G)** - A damper designed into a landing gear system for the purpose of suppressing pitching oscillations of the bogie assembly in a bogie type gear.

**DAMPER, SHIMMY (L/G)** - A damper designed into a landing gear system for the purpose of suppressing shimmy or oscillation of the wheel system. Especially on gear configuration with castering provisions such as nose or tail wheel.

**DAMPING BEHAVIOR (Tire)** - The characteristic of a tire which tends to damp out periodically applied forces.

**DAMPING, FRICTION (L/G)** - See COULOMB DAMPING.

**DAMPING, HYDRAULIC (L/G)** - A damping system in which a hydraulic fluid is utilized. External applied forces cause the oil to be moved through an orifice or restriction. Resisting force is proportional to the square of the velocity.

**DAMPING RATIO** - The ratio of actual damping to critical damping. It may be expressed as the ratio of output under static conditions to twice the output at the lowest frequency where a 90 degree phase shift is observed.

**DAMPING, STRUCTURAL (A/V, L/G, etc.)** - Damping due to internal friction within the material itself. It is independent of frequency and proportional to the maximum stress of the vibration cycle. Also called solid damping.

**DAMPING, VISCOUS (L/G, etc.)** - Damping encountered by bodies moving at moderate speed through a fluid. The resisting force is proportional to the velocity.

**DASHPOT (L/G, S/A)** - A type of shock absorber which utilizes resistance of oil being forced through an orifice or restriction to oppose an impact load. Differs from an air-oil shock absorber in that no air charge system is utilized.

**DEAD BAND (NWS, etc.)** - Free motion at the wheel(s) under control (output) over which the controlling system (input) has no authority. See also Backlash. May also apply to other mechanical systems. May also be defined as movement of the input control which produces no response in the output.

**DEAD LENGTH, ACTUATOR (L/G, etc.)** - Nominal length between attach points of an actuator when in the fully retracted condition less the available stroke.

**DECELERATION (Whl, etc.)** - The act or process of moving, or of causing to move, with decreasing velocity. Negative acceleration.

**DECK RUN, CATAPULT (Cat, Base)** - The distance from the end of the catapult power stroke to the beginning of the round down.

**DEFLECTION (Tire)** - The radial compression or displacement of a tire under load. This may be expressed by a finite value as the ratio (percentage) of the actual deflection measurement to the total available deflection (undeflected outside diameter less the wheel rim flange diameter) divided by two.

**DETECTOR (B/C, etc.)** - Sensor, also an instrument employing a sensor to detect the presence of something in the surrounding environment i.e., wheel speed sensor, proximity sensor, etc.

**DIFFERENTIATOR (B/C, etc.)** - In computer operations, a device whose output is proportional to the derivative of an input signal. In electronics, a transducer whose output wave form is the time derivative of its input waveform.

**DIRECTIONAL STABILITY (A/V, Tire, etc.)** - The properties of an aircraft, rocket, tire, etc. enabling it to restore itself from a yawing or side swiping condition. Also called weathercock stability.

**DISPLAY (L/G, B/C, etc.)** - The cockpit or crew station presentation of information regarding condition of a component or system such as landing gear position (up and locked, down and locked, in transit), brake overheat warning, etc.

**DOCKING (A/V, etc.)** - The act of coupling two or more orbiting objects. The operation of mechanically connecting together, or in some manner bringing together orbital payloads.

**DOLLY, CATAPULT (Base, Cat)** - A low, mobile platform that rolls on casters. A wheeled apparatus used to support an aircraft for launching from a catapult. A low wheeled platform used to support the nose wheel of an airplane for launching from a SATS catapult, and to which the aircraft is connected for launching. The airplane lifts off from the dolly at the end of the power stroke, and the dolly remains on the ground and is braked to a halt.

**DOOR, WHEEL FAIRING (A/V)** - A door in the Landing Gear installation for the purpose of fairing the wheel well to the contours of the aircraft after the wheels are retracted inside the vehicle.

**DOOR, STRUT FAIRING (A/V)** - A door in the landing gear installation for the purpose of fairing the gear strut well to the contours of the aircraft after the strut is retracted into the aircraft.

**DOWNLOCK (L/G)** - The downlock is a mechanism or device for locking the landing gear in the down or extended position preparatory to landing. It locks the structure in the proper position for taking loads imposed by ground operations. A downlock pin may be used to prevent inadvertent gear retraction while on the ground. Some types used are: (a) "on center" or "over center" side or drag brace held in position hydraulically and/or mechanically. (b) Secondary "Jury brace" held on or past center hydraulically and/or mechanically. (c) Lock pin engagement. (d) Hook and roller engagement (generally used for uplock), etc.

**DRAG BRACE (L/G)** - A structural brace of a landing gear system whose primary function is to react drag loads imposed on the system. This member may be a folding member and often serves a secondary function of locking the gear system in the extended and/or retracted position.

DRAG BRAKE (A/V) - A device for the purpose of providing a retarding force upon a body in motion through a fluid, parallel to the direction of motion of the body. See also GROUND SPOILERS, SPEED BRAKE.

DRAG CHUTE (A/V) - Any of various types of parachutes attached to high performance aircraft that can be deployed, usually during landings, to decrease speed and also, under certain flight conditions, to control and stabilize the aircraft.

DRAG EFFICIENCY, ANTISKID or BRAKING (B/C) - The measure of efficiency of a brake control system expressed as a ratio (percentage) of the actual drag performance produced over a given period of time (or distance) relative to the maximum (100%) drag performance obtainable for the given set of conditions (i.e., coefficient tire to runway, wet, dry, temp., etc.).

DRAG STAY (L/G) - See DRAG BRACE.

DRIVE COUPLING (B/C) - See COUPLING.

DROP TEST (L/G, A/V) - A type of test to determine the dynamic capabilities of a landing gear shock absorber system to accept the loads and kinetic energies specified and imposed upon it. The shock absorber system may be mounted in a test rig and dropped at specified loads and velocities, or a complete aircraft may be free dropped. The test is for the purpose of verifying the energy absorption capability and for optimization of the energy control system (hydraulic., pneumatic, mech., etc.) .

DUTY CYCLE (L/G, Tire, Brk, Whl) - One complete taxi-take-off and landing-taxi cycle.

DYNAMIC LOAD (L/G, Tire, etc.) - A load imposed by dynamic action, as distinguished from a static load. Specifically, with respect to aircraft, rockets, or spacecraft, a load due to an acceleration, as imposed by gusts, maneuvering, landing, firing rockets, braking, catapulting, etc.

DYNAMIC STABILITY (A/V) - The characteristics of a body, such as an aircraft, that causes it, when disturbed from an original state of steady flight or motion, to damp the oscillations set up by restoring moments and gradually return to its original state, specifically, the aerodynamic characteristics.

DYNAMIC TORQUE (Brk) - The torque which a brake will produce for deceleration dynamically as opposed to static torque. Dynamic torque is affected by velocity, temperature, lining coefficient, and other factors.

DYNAMOMETER, ROADWHEEL (Brk) - A device for measuring (testing) forces and power or capability of brakes. Generally the system includes a large rotating steel wheel (mass) which is brought up to speed by external power and represents an inertia equivalent to which the brake is to be tested. The test brake/wheel/tire assembly is loaded against the dynamometer wheel and the power of the brake is utilized to stop the rotating mass.

DYNAMOMETER, SHAFT (Brk) - A device for measuring (testing) forces and power or capability of brakes. No tire; torque and inertia only.

DYNAMOMETER, TIRE TEST (Tire) - See also Dynamometer, Brake Test. A device for measuring (testing) capabilities of tires. Differs from a Brake Test Dynamometer in that an Inertia Equivalent is generally not required. The dynamometer wheel is powered to rotate and the tire is loaded radially against it. Tire test parameters of interest are usually load, speed, time, and distance.

EFFICIENCY, RETRACTION (L/G) - A measure of efficiency for retraction of a landing gear system represented by a ratio (percentage) i.e., area under the load/stroke curve for the actuator compared to the maximum attainable load/stroke curve area for the actuator.

EFFICIENCY, SHOCK ABSORBER (L/G, S/A) - A measure of efficiency for a shock absorber represented by a ratio (percentage) i.e., area under the load stroke curve for the shock absorber compared to a theoretical straight line (horizontal) load/stroke curve representing maximum attainable output.

**ELECTRO-MECHANICAL ACTUATOR (Brk, L/G)** - In the context of the brake assembly, the electro-mechanical actuator (EMA) is the brake subassembly, typically comprised of but not limited to, the ball screw or roller screw, electric motor, and gear train that converts electrical power to brake clamping force. Some landing gear assemblies may also use EMAs for landing gear actuation or other motion control.

**ELECTRO-MECHANICAL ACTUATOR BRAKE POWER (Brk)** – EMA brake power is the electrical power supplied to the brake (typically only the EMAs on the brake).

**ELECTRO-MECHANICAL ACTUATOR BRAKE VOLTAGE (Brk)** – EMA brake voltage is the electrical voltage applied to the brake assembly to generate clamping loads.

**ELECTRO-MECHANICAL ACTUATOR CONTROLLER (EMAC)** – The electro-mechanical actuator controller (EMAC) is the electronic subassembly of the electric brake control system that determines and applies the electrical power to the electro-mechanical actuator to generate clamping loads.

**ENERGY, BRAKE (A/V, Brk)** - The portion of total energy of an aircraft which in deceleration process goes to the brake. Other portions go to aerodynamic drag, rolling resistance, etc.

**ENERGY, DRAG CHUTE (A/V)** - The portion of total energy of an aircraft which in the deceleration process goes into the drag chute in the form of aerodynamic drag.

**ENERGY LOSSES (Tire)** - Tire loss of energy due to rolling resistance of the tire which includes consideration of forces required to compress the tire as it rolls, as well as the work required to flex the tire carcass.

**ENERGY, SHOCK ABSORBER (A/V, S/A)** - The portion of the total aircraft energy which in the landing process goes into the shock absorber(s). Generally, it is the part due to the vertical sink speed of the vehicle at touchdown although some of this energy is damped out in the aircraft structure, and tires.

**ENERGY, TIRE (A/V, Tire)** - The portion of the total aircraft energy which in the landing process goes into the tires. The tires also absorb energy during the braking process.

**EQUIVALENT SINGLE WHEEL LOAD (A/V, Base)** - A theoretical calculated load which, if applied to a single tire, with a contact area equal to that of one tire of the assembly, would produce the same effect on the airfield as does a multiple wheel assembly.

**EQUIVALENT STATIC WHEEL LOAD (Tire, Whl)** - A static wheel or tire load rating based on a dynamic load reduced by a specified factor. May be higher than the actual required static load rating for a specific application, in which case the tire/wheel static rating is dictated by this consideration rather than the actual static rating requirement.

**EXPANDABLE TIRE (Tire)** - A tire which in the free, uninflated state assumes a shape which is smaller in diameter and cross section than when in the inflated state. For the purpose of conserving stowage volume in the aircraft. Requires deflation after takeoff and prior to retraction, and reinflation after gear extension and prior to landing.

**EXTENDED POSITION (L/G, S/A)** - The configuration of a retractable landing gear when it is down and locked and ready for landing and supporting the aircraft. Also used in describing the state of a shock absorber when it is in the unloaded or uncompressed position.

**FAIL SAFE (L/G, B/C, NWS., etc.)** - A design or systems used to minimize risk in case of a malfunction. For example, a steering control system designed to fail in a free caster mode rather than a wheel hard over condition.

**FALSE AXLE (L/G)** - See AXLE SLEEVE.

**FEEDBACK** - (1) The return of a portion of the output of a device to the input; positive feedback adds to the input, negative feedback subtracts from the input. (2) Information, as to progress, results, etc., returned to an originating source.

FEEDBACK CONTROL LOOP (B/C, etc.) - A closed transmission path (loop), which includes an active transducer and which consists of a forward path, a feedback path, and one or more mixing points arranged to maintain a prescribed relationship between the loop input signal and the loop output signal.

FEEDBACK CONTROL SYSTEM (B/C, etc.) - A control system, comprising of one or more feedback control loops, which combines functions of the controlled signals with functions of the commands to tend to maintain prescribed relationships between the commands and the controlled signals.

FLAT SPOTTING (Tire) - The wearing of a flat spot on a tire by means of skidding due to excessive braking, faulty skid control, or failed wheel bearing.

FLEXIBLE PAVEMENT (Base) - See PAVEMENT, FLEXIBLE.

FLOAT (A/V) - A device or component part of an aircraft which permits it to remain suspended upon the surface of a body of water without sinking: Also to maneuver upon, takeoff, and land upon a body of water.

FLOLS (Base) - Fresnel Lens Optical Landing System. Also see Reference (f).

FLOTATION, GROUND (A/V, etc.) - The process of supporting an aircraft on the surface of the ground without sinking into the ground. Also used to describe capability of pavement and other surfaces on the surface of the ground to support a vehicle or object.

FOOTPRINT AREA (Tire) - See TIRE.

FOREIGN OBJECT DAMAGE (FOD) (A/V, Tire, etc.) - Material which, if left in the taxi path of an aircraft, could cause damage to tires, engine, or other aircraft structures. Also damage resulting from contact with foreign objects.

FORK (L/G) - The structural member of a shock strut assembly which supports the axle and extends alongside the wheel and tire and connects to the basic shock strut.

FORK, FULL (L/G) - A configuration of landing gear fork which supports the axle on both ends, extends adjacent to the wheel on both sides, and joins around the tire to attach to the basic shock strut.

FORK, HALF (L/G) - A configuration of landing gear fork which supports the axle on one end only, lies adjacent to the wheel on one side only, and attaches to the shock strut assembly.

FREE FALL (L/G) - Descriptive term for a retractable landing gear configuration capable of moving from the stowed (up and locked) position to the extended (down and locked) position by means of gravitational forces and air loads. Generally may include also bungee assist for operation of downlock and/or overcoming specific points of resistance in the system.

FREE ROLLING (Whl, Tire) - A free rolling wheel/tire is one that is neither powered (driven) nor braked. The peripheral velocity in the contact zone then is the same as ground velocity.

FREQUENCY RESPONSE (B/C, etc.) - (1) The portion of the frequency spectrum which can be sensed by a device within specified limits of amplitude error. (2) Response of a system as a function of the frequency of excitation.

FRICTION UNIT FORCE (Brk) - A measure of the shearing force on the brake friction material. Equals brake torque divided by the product of brake friction radius times lining area.

FUSE, HYDRAULIC (A/V) - A hydraulic device, designed to shut off flow of fluid if the flow exceeds a specified value. Used in brake systems to stop flow and depletion of the A/V fluid system if a line rupture or similar failure occurs.

FUSIBLE PLUG (Whl) - A thermal sensitive pressure release device used to prevent tubeless tire or wheel assembly failure when an overheat condition occurs which would cause degradation of wheel and/or tire structural properties.

GEAR CONFIGURATION, BICYCLE (L/G) See Figures 3 and 4 - Configuration in which there are two gear assemblies, arranged in tandem design, one behind the other. Generally includes outrigger gears also for ground stability, i.e., B-47 and Harrier aircraft.

GEAR CONFIGURATION, DUAL TWIN (L/G) See Figures 3 and 4 - Configuration in which the axle arrangement is such that two wheel/tire assemblies are located on either side of the shock strut or supporting member, i.e., C-5A nose gear.

GEAR CONFIGURATION, DUAL TWIN TANDEM (L/G) See Figures 3 and 4 - Configuration in which there are two axles, one behind the other, connected by an axle beam, and each of which is a dual twin wheel/tire arrangement, i.e., B-58 main gears. (K)

GEAR CONFIGURATION, QUADRACYCLE (L/G) See Figures 3 and 4 - Configuration in which four main landing gear assemblies are located, one in each aircraft quadrant. An arrangement of two main gear, side by side, with one set behind or in tandem with the first set. May also include outrigger gears for ground stability, i.e., B-52 aircraft (I)

GEAR CONFIGURATION, TWIN TANDEM WITH TWIN CENTER GEAR (L/G), i.e., A340, MD11. See Figures 3 and 4. (M)

GEAR CONFIGURATION, TWIN TANDEM WITH TWIN TANDEM CENTER GEAR (L/G), i.e., IL86, IL96. See Figures 3 and 4. (N)

GEAR CONFIGURATION, MULTI-TANDEM MAIN GEAR (L/G) See Figures 3 and 4, i.e., AN124 (T), AN225. (U)

GEAR CONFIGURATION, SINGLE WHEEL (L/G) See Figures 3 and 4 - Configuration utilizing only one wheel/tire assembly on the gear assembly. (A) and (B)

GEAR CONFIGURATION, TANDEM (L/G) (Also single tandem) See Figures 3 and 4 - Configuration on which the two wheel/tire assemblies are mounted on separate axles one behind the other or "in tandem", i.e., Avro Arrow C130. (F)

GEAR CONFIGURATION, TRICYCLE (L/G) See Figures 3 and 4 - General descriptive term for an arrangement with three gear assemblies, one in front and two main gears located aft, in a tricycle arrangement. Each gear may have its own configuration depending upon the number of wheel/tire assemblies and the individual arrangement, i.e., B707, DC-8, B767. (G)

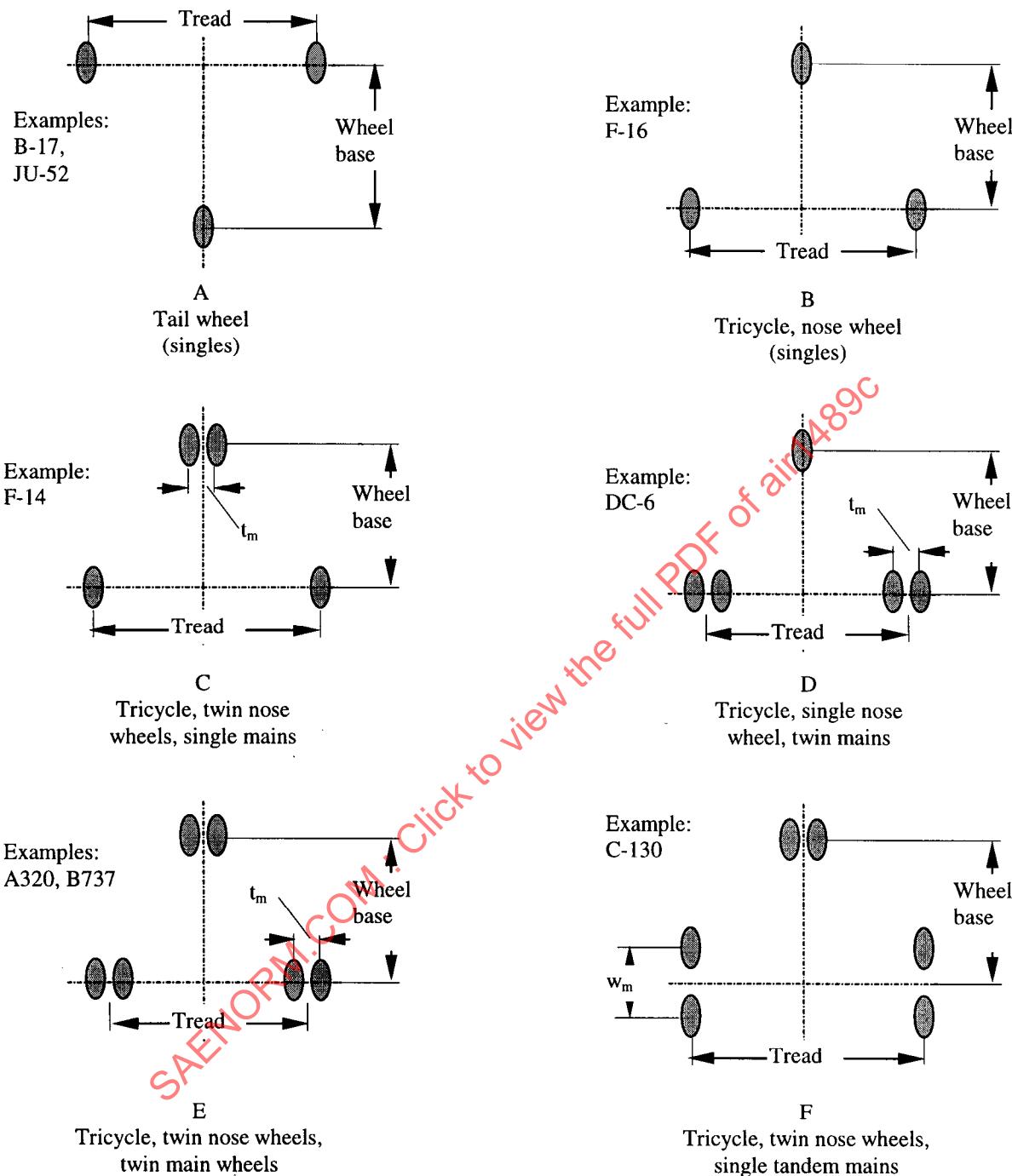
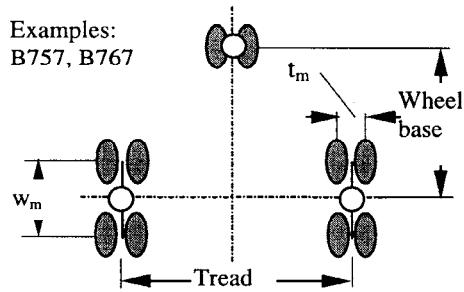
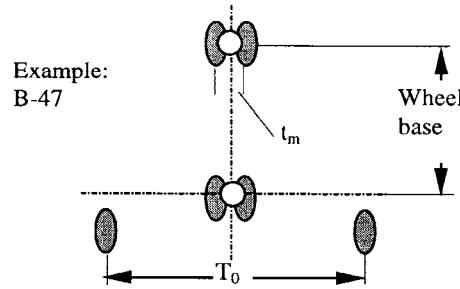


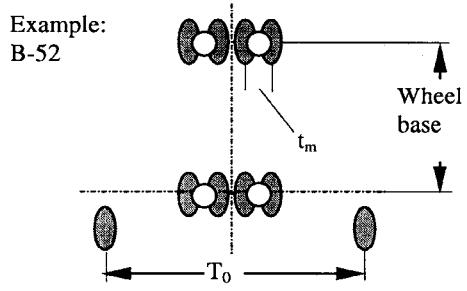
FIGURE 3 - AIRCRAFT LANDING GEAR CONFIGURATIONS



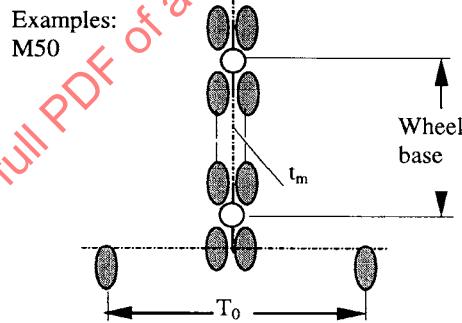
G  
Tricycle, twin nose wheels, twin tandem mains



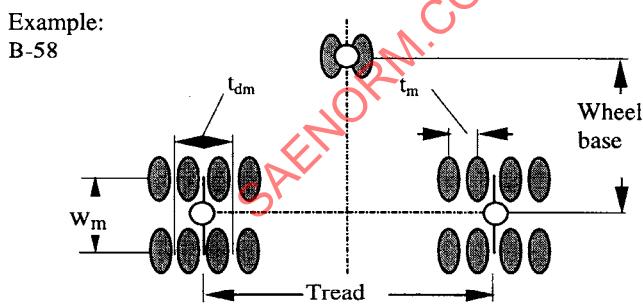
H  
Bicycle, two twin main wheels, plus outriggers



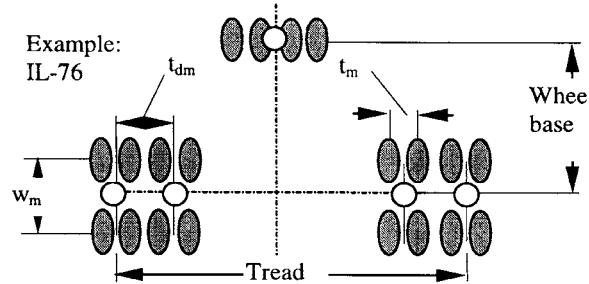
I  
Quadracycle, four twin main wheels, plus outriggers



J  
Twin bicycle, four twin main wheels, plus outriggers



K  
Tricycle, twin nose wheels, dual twin tandem main wheels



L  
Tricycle, dual twin nose wheels, dual twin tandem main wheels

FIGURE 3 (CONTINUED)

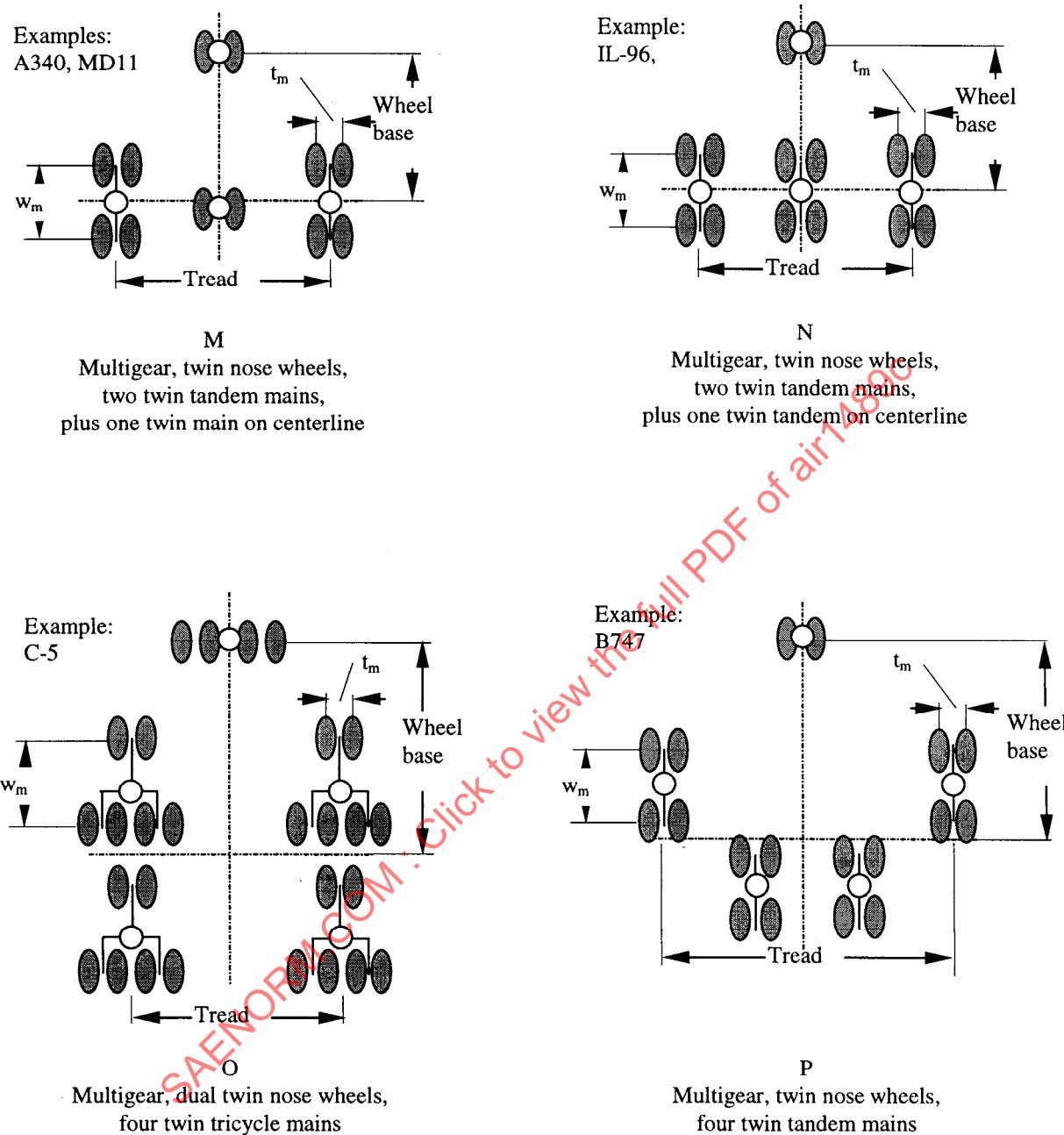


FIGURE 3 (CONTINUED)

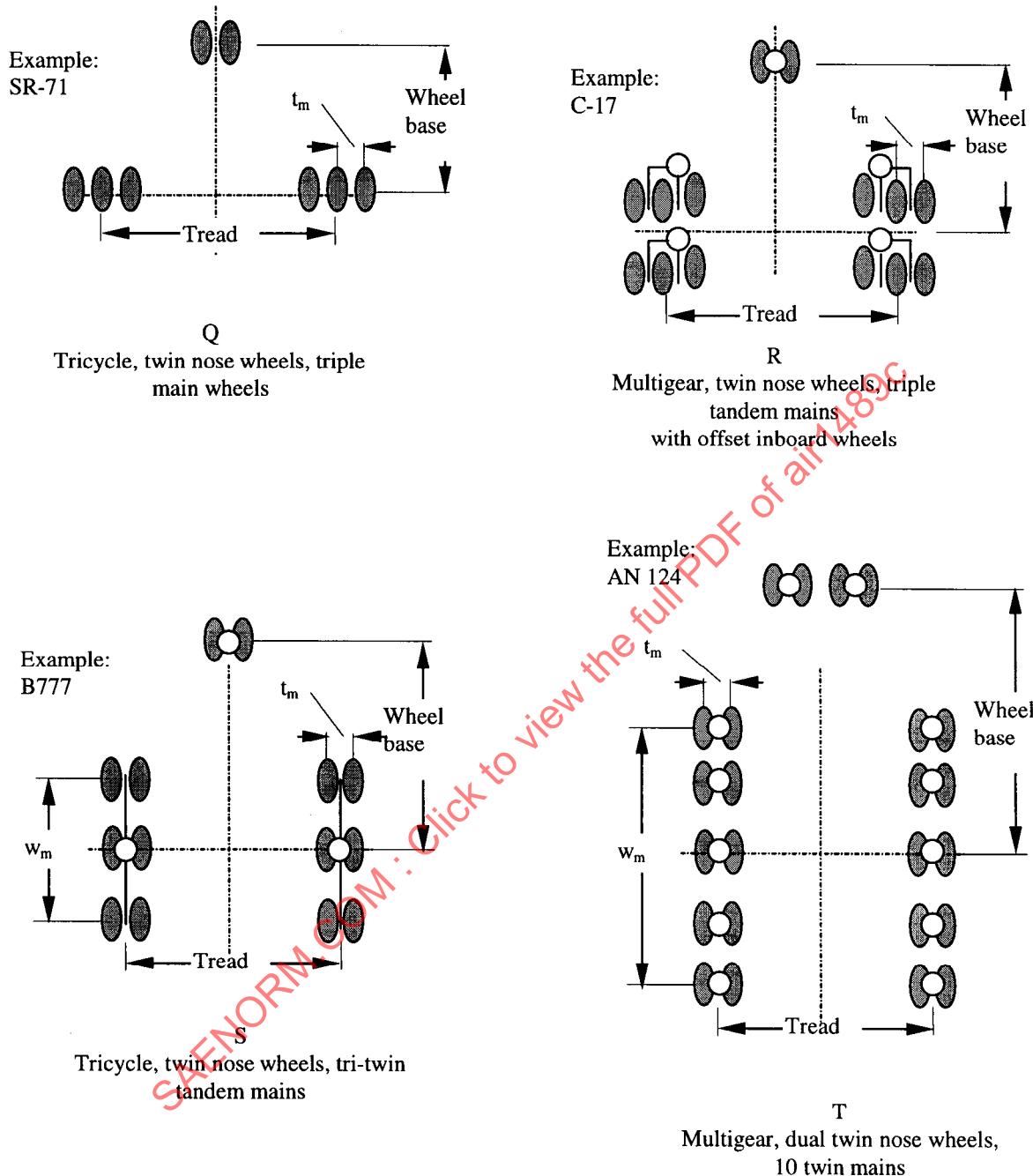
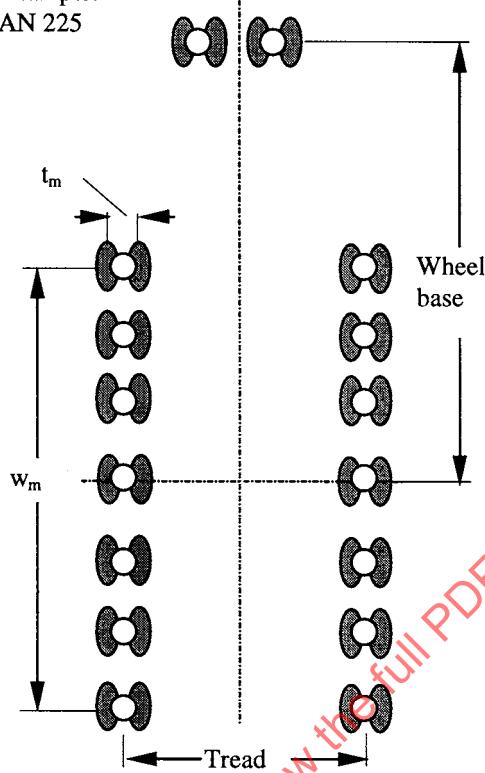


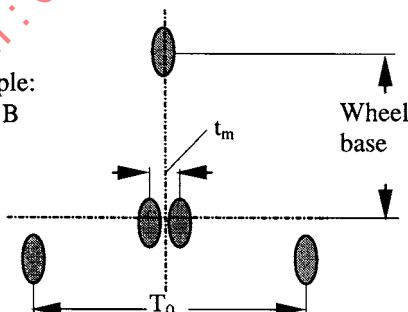
FIGURE 3 (CONTINUED)

Example:  
AN 225



U  
Multigear, dual twin nose wheels,  
14 twin mains

Example:  
AV-8 B



V  
Bicycle, single nose wheel,  
twin main wheels, plus outriggers

FIGURE 3 (CONCLUDED)

## LANDING GEAR CONFIGURATION CODE

Digits in three blocks:

- Block A
  - 1. First digit; number of struts
  - 2. Second digit; N → tricycle nose wheel; T → tail wheel; O → outrigger gear
  - 3. Number of wheels; first axle or S for skid
  - 4. Number of wheels; second axle
- ↓
- Block B
  - 1. First digit; number of struts
  - 2. Second digit; F → fuselage or body mounted; W → wing mounted
  - 3. Number of wheels; first axle or S for skid
  - 4. Number of wheels; second axle
- ↓
- Block C same as Block B if necessary

## EXAMPLES

	<u>A</u>	<u>B</u>	<u>C</u>
A320	1N2	2W2	
A340-300	1N2	2W22	1F2
A340-600	1N2	2W22	1F22
B777	1N2	2W222	
B747	1N2	2W22	2F22
C-17	1N2	4F12	
C-5	1N4	4F222	
B-52	2O1	4F2	
B-17	1T1	2W1	
F-16	1N1	2F1	
M-50	2O1	2F22	
IL-76	1N4	4F4	
AN-124	2N2	10F2	
AV-8	2O1	1F1	1F2
X-15	1N2	2FS	

NOTE: This landing gear configuration code may not be appropriate for some helicopter applications.

FIGURE 4 - LANDING GEAR CONFIGURATION CODE AND SAMPLE APPLICATIONS

GEAR CONFIGURATION, TRI-TANDEM See Figures 3 and 4. (L/G) - Configuration in which three wheel/tire assemblies are arranged one behind the other or "in tandem" on a single gear assembly.

GEAR CONFIGURATION, TRI-TWIN TANDEM (L/G) See Figures 3 and 4 - Configuration in which there are three axles, one behind the other, connected by means of an axle beam, and each of which carries two wheel/tires assemblies, i.e., B777 main gear. (S)

GEAR CONFIGURATION, TRIPLE WHEEL (L/G) See Figures 3 and 4 - Configuration in which there is one axle on which are located three wheel/tire assemblies, i.e., SR-71 main gear. (Q)

GEAR CONFIGURATION, TWIN TANDEM (L/G) See Figures 3 and 4 - Configuration in which there are two axles, one behind the other, connected by an axle beam, and each axle having two wheel/tire assemblies, i.e., DC-8, A330, B-707, L1011 main gears. (G)

GEAR CONFIGURATION, TWIN TRICYCLE (L/G) See Figures 3 and 4 - Configuration of an individual landing gear assembly on which there are three axles, each mounting two wheel/tire assemblies. The axle arrangement is one in front, and two aft in a tricycle arrangement, i.e., C-5A main gears. (P)

GEAR CONFIGURATION, TWIN WHEEL (L/G) See Figures 3 and 4 - Configuration in which there is one axle on which is mounted two wheel/tire assemblies, i.e., A320, B737. (E)

GEAR, LEVER SUSPENSION (L/G) See Figure 1 - A gear arrangement in which the axle is mounted at the aft end of a lever (structural member) which is pivoted at the forward end to permit freedom for the wheels to ride up and over bumps and/or obstructions. The lever motion is controlled by a shock absorber connected between the lever and the strut or other fixed structure.

GEAR, MAIN (L/G) - The main gear forms the principle support of the aircraft on land or water. It may include any combination of wheels, tires, floats, skis, shock absorbing mechanisms, brakes, retracting mechanisms, and structural provisions necessary for attachment and operation. The combination may be in varied configurations.

GEAR, NEUTRAL (L/G) - A gear assembly which may be utilized on either right hand or left hand positions on the aircraft.

GEAR, NOSE (L/G) - The nose gear is an auxiliary landing gear unit. In addition to supporting some weight of the aircraft, it provides balance, controls the aircraft attitude and gives ground stability. In many instances, it includes provisions for steering the aircraft. It is located forward on the aircraft or at the nose.

GEAR OUTRIGGER (L/G) - The outrigger is an auxiliary gear which supports some weight of the aircraft under some conditions. It is located at the outer extremities (i.e., wing tip, etc.) of the airplane and is designed to alleviate overturning and to provide stability during ground operations, i.e., B-52 outrigger or wing tip gear.

GEAR, SCOOTER (L/G) - A gear arrangement in which there are usually two axles located one behind the other and connected by an axle beam. Main support for the bogie assembly is a pin ended shock absorber attached between the axles and connected to the gear structure at the upper end. The forward end of the axle beam is pin jointed to a post which is free to slide within a structural cylinder assembly. The post assembly carries drag, side and torque loads. Vertical load is carried basically by the shock absorber. In the side view the forward located post with one axle under the post and the other aft, gives the appearance of a "scooter."

GEAR, TAIL (L/G) - The tail gear is an auxiliary gear which supports a small portion of the aircraft weight, and usually consists of a shock strut, wheel/tire assembly, (or skid) and controlling devices. It is sometimes steerable. The tail gear is located in the aft or tail portion of the aircraft.

GEAR WALK (L/G) - Cyclic fore and aft motion of the landing gear strut assembly about a normally static vertical strut centerline. Caused by drag loads applied at the tire/ground interface and the natural spring rate of the gear-wing structure. Sometimes aggravated by anti-skid braking action (cycling) and resonant frequency of vibration of the strut.

**GREAVES (L/G)** - (1) Armor to protect the legs, (2) In landing gear usage, armor to protect the struts or equipment mounted thereon from arresting cables, barrier straps, etc.

**GROUND FLOTATION (L/G, Base)** - Characteristic definition used in describing the capability of an aircraft to operate satisfactorily on or from a specific airfield with respect to bearing and support parameters of that airfield.

**GROUND LOADS (L/G)** - Any load imposed on the landing gear assembly by contact with the ground during any ground operation, i.e., drag, side, vertical, torsion, spin up, spring back, towing, turning, catapulting, etc.

**GROUND SAFETY LOCK (L/G)** - A flagged device designed to prevent inadvertent retraction of the gear when the aircraft is on the ground and supported by the gear. Generally installed manually after landing and removed prior to flight. Also used on landing gear doors and arresting hooks to provide safety for ground maintenance personnel.

**GROUND SPOILERS (A/V)** - A device or system designed to "spoil" or reduce the aerodynamic lift on the aircraft quickly after touchdown, thus applying weight to the gears and enabling braking action for deceleration of the aircraft. See also Speed Brake.

**HEAT PACK (Brk)** - See HEAT SINK.

**HEAT SINK (Brk)** - The portion of the brake which provides the primary storage medium for the brake energy portion of the energy dissipated in deceleration of the aircraft. (Aircraft kinetic energy converted to heat energy.) Generally includes the rotors, stators, and sometimes portions of the back plate, pressure plate, etc.

**HEAT SINK LOADING (Brk)** - A measure of the energy absorbed per unit weight by the brake heat sink during a single stop. Equals the brake energy portion of the aircraft total kinetic energy divided by the heat sink weight (foot pounds per pound or joules per kilogram).

**HIKING (L/G)** - Extension of the landing gear from its normal static position to facilitate service, passenger loading, landing gear takeoff configuration, and the like.

**HOLDBACK (A/V)** - A device or assembly designed for restraining the aircraft during engine run up.

**HOLDBACK BAR (A/V, Cat)** - A rigid holdback and release assembly used to restrain the aircraft prior to launch specifically from a nose gear launch catapult system.

**HOLDBACK, ENGINE RUN UP (Base)** - A device or assembly designed to restrain the aircraft during engine trim procedures and full power checkouts.

**HOLDBACK FITTING, AIRCRAFT (A/V)** - The attachment point or device on the aircraft to which the holdback is coupled for engine runup or for catapulting. Usually located on aft fuselage for bridle/pendant launched aircraft, and on aft side of the nose gear for nose gear launched aircraft. See Reference (i).

**HOLDBACK AND RELEASE ASSEMBLY (Cat)** - A device or assembly designed to restrain the aircraft against engine thrust, ship motion and tensioning forces prior to catapulting. Once the catapult is fired, the holdback and release assembly is designed to release at a specific load, usually by means of a frangible link (tension ring or tension bar), thus permitting the aircraft to be accelerated by the catapult. Now superseded by the repeatable release holdback bar.

**HOLDBACK BAR, REPEATABLE RELEASE (Cat)** - A device or assembly designed for catapult holdback and release which may be used repeatedly without dependence on or replacing a frangible link. See Reference (j).

**HOLD DOWN (A/G)** - A device or assembly part of the arresting hook installation of an aircraft, designed to hold down the hook after deployment and contact with the deck (runway) to prevent hook bounce and insure engagement with the arresting gear cable. See also DASHPOT and SNUBBER. See Reference (g).

**HOOK, DOWNLOCK (L/G)** - A hook designed to engage a roller or restraining device and lock the gear assembly in the down position, ready for touchdown and to resist applied ground loads.

**HOOK POINT (L/G, A/G, etc.)** - The point of a hook as designed for proper engagement of operation in a mechanism. In an arresting hook installation, that portion of the arresting hook assembly which engages the arresting gear cable. Usually detachable from the arresting hook shank for wear replacement purposes. See Reference (g).

**HOOK, UPLOCK (L/G)** - A hook designed to engage a roller or restraining device and lock the gear and/or door assembly in the up or stowed position in a safe condition for all modes of flight maneuvering of the aircraft.

**HOOKUP (Cat)** - The process or operation of preparation of the aircraft for launch from a catapult. Includes engagement of the holdback and attachment of the catapult bridle or launch bar. The condition in which the aircraft is spotted on the catapult ready for tensioning. See Reference (f).

**HYDRAULIC BULK MODULUS (Brk, L/G)** - The hydraulic bulk modulus is a measure of resistance to compressibility of a fluid. Two methods include the secant bulk modulus and the tangent bulk modulus.

**HYDROBURST (Tire)** - The procedure used for burst testing of tires in which water is used as the pressurizing medium rather than air. Avoids the explosive decompression effect of air.

**HYDROPLANE (A/V, Tire, etc.)** - The name given to a pneumatic tire operating condition in which the water on a wet runway or surface is not displaced from the nominal tire-ground contact area by a rolling tire or by a moving but non-rotating (full skidding) tire at a rate fast enough to allow the tire to make contact with the ground surface over its complete nominal footprint area, as would be the case of operation on a dry ground surface. When hydroplaning occurs, the tire rides on a wedge or film of water over a part or all of its footprint area, depending upon conditions.

**HYDROPLANING, DYNAMIC (A/V, Tire)** - The process of hydroplaning associated with movement of a body over water. To skim over water at high speed. See also HYDROPLANE.

**HYDROPLANING SPEED (A/V, Tire)** - Tire hydroplaning develops progressively from low speed through an intermediate range where the tire progressively loses contact with the runway and, finally, at sufficient forward speed, total hydroplaning develops. For a rotating tire:  $V_H = \sqrt[3]{p}$ ; for a non-rotating tire  $V_H = \sqrt[7]{p}$ . Where hydroplaning speed  $V_H$  is expressed in knots and tire inflation pressure  $p$  is expressed in psi. Some testing has indicated that modern H-type and radial tires typically have hydroplaning speeds lower than that predicted by these equations.

**HYDROPLANING, TOTAL (A/V, Tire)** - A hydroplaning situation in which the total tire footprint (contact area) is supported by a film of water.

**HYDROPLANING, VISCOUS (Tire)** - Another term for total hydroplaning i.e., the tire contact footprint is supported by a film of viscous fluid (water).

**HYDRO SKI (L/G)** - A type of landing gear designed to enable an aircraft to takeoff and land on water (e.g., water ski).

**INCIPIENT SKID (A/V, B/C)** - The point of tire to runway instability where brake torque exceeds resisting tire-runway friction torque and the wheel, therefore, begins a deceleration condition, which if continued would result in abrupt wheel lock-up.

**INDICATOR, GEAR POSITION (A/V)** - An instrument or indicator for the purpose of providing information to the pilot or crew regarding position of the landing gear. May be located at the pilot or crew station or remotely (e.g., pop up indicator projecting above upper surface of wing above the gear). Green lights are used for safe configurations and red lights for unsafe or in transition conditions and "up" and "down" to indicate up and locked or down and locked.

**INDIVIDUAL WHEEL CONTROL (B/C)** - One type of control used in antiskid system where each wheel utilizes its own valve and control circuit.

**INERTIA** - Resistance to acceleration or deceleration.

**INERTIA EQUIVALENT (Brk)** - In brake testing, amount of aircraft mass required in conjunction with aircraft velocity to equate to that portion of the aircraft energy being absorbed by a single brake or a brake and tire assembly. This equivalent energy is translated into dynamometer energy which is absorbed by the brake or brake and tire assembly in the test process.

**INERTIA, MOMENT OF** - (Tire, Wheel, etc.) Inertia of a body about an axis, defined as:  $I = \sum MR^2$ , where M is the mass of a particle of the body and R is its distance from the axis.

**INFLATION PRESSURE** (Tire, etc.) - The pressure (gage) to which the tire is to be inflated for a specific load and deflection, usually the rated pressure for a given service application.

**INLET FILTER (B/C)** - A fluid contamination filter located upstream of the skid control valve or other hydraulic unit.

**INNER TUBE** (Tire) - A rubber tube located within a pneumatic tire for the purpose of sealing in the air.

**INTEGRATOR (B/C, etc.)** - (1) A device whose output is proportional to the integral of an input signal. (2) In digital computers, a device for accomplishing a numeric approximation of the mathematical process of integration.

**JACK (HYDRAULIC ACTUATOR) (A/V)** - See ACTUATOR.

**JACK (Base)** - A device usually hydraulic (but may be pneumatic or mechanical), for the purpose of lifting or raising heavy weights such as aircraft. Various types and configurations are used such as axle jacks, fuselage jacks, etc.

**JACK PAD (L/G)** - A pad or surface built on a landing gear for the purpose of accepting jacking loads or a separate attachable jack fitting.

**JACK POINT (L/G)** - A raised point, usually spherical, on a landing gear for the purpose of accepting the lifting forces imposed by a jack.

**JUDDER (L/G)** - A mode of gear vibration. See also GEAR WALK.

**JURY STRUT (OR BRACE) (L/G)** - A secondary toggle kinematic arrangement to provide a lock for the gear assembly in a specific configuration. A secondary brace which locks the primary brace in position, both of which are "on center" or near "on center" condition. Also, a piece of ground support equipment used to provide extra bracing for movable or folded assemblies against abnormally high loads; i.e., to brace folded wings on carrier-based aircraft against heavy weather conditions.

**"K" MODULUS (Modulus of Soil Reaction) (Base)** - (1) The load in psi on a loaded area of the subgrade divided by the deflection in inches of the subgrade under that load. (2) The total load in pounds divided by the total volume displaced in cubic inches. The "K" modulus is used as a unit measurement in rigid flotation analysis.

**KNEELING GEAR (L/G)** - A landing gear assembly or installation designed to "kneel" the aircraft for ground handling purposes, such as parking, loading, maintenance, catapulting, etc. The gear may retract to an intermediate position or fold in a manner different from normal retraction. A mechanism for raising or lowering the aircraft while parked on the ground.

**LAG (B/C, etc.)** - (1) The delay between change of conditions and the indication of the change on an instrument. (2) Delay in human reaction. (3) The amount one cyclic motion is behind another, expressed in degrees. The opposite is lead.

**LANDING GEAR (L/G)** - The apparatus comprising those components of an aircraft or spacecraft that support and provide mobility for the craft on land, water, or other surfaces. The landing gear consists of wheels, floats, skids, bogies, and treads, or other devices, together with all associated struts, bracing, shock absorbers, etc. Landing gear includes all supporting components, such as the tail wheel or tail skid, outrigger wheels or pontoons, etc., but the term is often conceived to apply only to the principal components, i.e., to the main wheels, floats, etc., and the nose gear if any. For military aircraft, catapulting provisions and the arresting hook installation are often considered ancillary components of the landing gear.

**LANDING GEAR EXTENDED SPEED (A/V)** - Maximum speed at which an aircraft can be safely flown with the landing gear extended.

**LANDING GEAR OPERATING SPEED (A/V)** - Maximum speed at which the landing gear can be extended or retracted.

**LANDING MAT (Base)** - A ground cover laid down for the purpose of supporting aircraft operations, i.e., parking, taxi, takeoff, landing. Some types used are pierced metal strips or aluminum planks.

**LATERAL SPRING CONSTANT (Tire) (Also called Lateral Spring Rate)** - The number of unit loads required to produce a unit deflection in a lateral direction (normal to plane of the wheel).

**LAUNCH BAR (Cat)** - In a nose gear launch system, the link which provides means of steering the nose gear during tracking and couples the aircraft to the catapult during the power run; part of the nose gear assembly.

**LAUNCHER (Base)** - (1) Specifically, a structure or device often incorporating a tube, a group of tubes, or a set of tracks, from which self-propelled missiles or aircraft are sent forth and by means of which the missiles or aircraft are aimed or imparted inertial guidance - distinguished in this specific sense from a catapult. (2) Broadly, a structure, machine, or device including the catapult, by means of which airplanes, rockets, or other vehicles are directed, hurled or sent forth.

**LAUNCHING RUN (Cat)** - During catapulting, the extent of aircraft travel from Release to the end of Deck Run. It is the sum of the power run or power stroke and the deck run.

**LCG or LOAD CLASSIFICATION GROUP (L/G, Base)** - A graphical method of the LCN formulas that determines Equivalent Single Wheel Load (ESWL) but makes no distinction between asphalt (flexible) and concrete (rigid) pavement.

**LCN or LOAD CLASSIFICATION NUMBER (L/G, Base)** - Method of aircraft evaluation and pavement design formulated in the UK after WWII, accepted by ICAO in 1956 for classifying flotation criteria for runway and takes into account the differences in pavement types between rigid and flexible.

**LEAD (B/C)** - The amount one cyclic motion is ahead of another, expressed in degrees. The opposite is lag.

**LEG (L/G)** - A single landing gear structure or assembly.

**LEVERED SUSPENSION (L/G)** - A type of landing gear arrangement in which an axle is supported on a trailing arm from a structural post or support. The trailing arm rotates about the pivot as a lever to provide the vertical wheel motion for shock absorption. See Figure 1.

**LIFT DAMPERS (A/V)** - See GROUND SPOILERS.

**LIFT RATIO (Tires)** - The ratio of the tire outside diameter to the rim diameter of the wheel (bead seat diameters).

**LIMIT CYCLING (B/C, etc.)** - A repetitive on-off cycling of brake pressure by the locked wheel circuit. Limit cycling is also used in evaluating and testing landing gear structures.

**LINER (Tire)** - Rubber lining of a tubeless tire engineered to prevent diffusion of inflation gas into the casing.

**LINING, BRAKE (Brk)** - A specially compounded material applied to rotor, stator, or brake shoe to create a predictable coefficient of friction and act as a wear surface in the brake assembly.

**LINING LOADING (Brk)** - A measurement of the total amount of energy absorbed through- the interface of each square unit of lining and its mating surface over a short period of time or a single stop.

$$\text{Lining Loading (LL)} = \frac{\text{Kinetic Energy (KE)}}{\text{Lining Area (A)}}$$

**LINING POWER (Brk)** - A measure of the average amount of energy absorbed by a square unit of lining area and its mating surface during each second.

$$\text{Lining Power (P)} = \frac{\text{Lining Loading}}{\text{Stop Time}}$$

**LIQUID SPRING (S/A)** - A type of shock absorber which is completely filled with fluid and which utilizes the compressibility of the fluid for the shock absorption function. It provides a relatively high spring rate compared to an air-oil type shock absorber.

**LOAD, ASSEMBLY (L/G)** - See ASSEMBLY LOAD.

**LOAD CLASSIFICATION NUMBER (LCN) (Base)** - A rating number which indicates the capability of an aircraft with specific tire/wheel equipment to operate from a given type of airbase. Intercontinental express = 100; light service = less than 14.

**LOAD DEFLECTION CURVE (Tire, etc.)** - For a tire, a plot of applied load (usually the abscissa) versus the deflection (usually the ordinate). Also, usually provided for a given (or multiple) inflation pressure.

**LOAD, DYNAMIC (L/G)** - A load imposed by dynamic action as distinguished from a static load. Specifically with respect to aircraft, rockets, or spacecraft, a load due to an acceleration of the craft, as imposed by gusts, by maneuvering, by landing, taxiing, take off, turning, etc.

**LOAD FACTOR (L/G)** - (1) A number which yields the inertial load (g load) when multiplied by the weight of the object. (2) The ratio of two loads (basic load is the denominator). The load factor for a landing gear assembly is obtained by dividing the sum of the external forces acting upon it by the static load. For example, the vertical load factor N is:

$$N = \frac{\text{Maximum Dynamic Load}}{\text{Static Load}}$$

The force of gravity does not appear in the sum of external forces because on each particle of mass, the gravity force is canceled by the inertial force of free-fall acceleration.

**LOAD, HOLDBACK (A/V)** - The load applied to the aircraft holdback fitting. The load results from the buffing force during deceleration of the aircraft from taxi-in velocity, or from the simultaneous application of catapult tensioning force, aircraft full takeoff power, and ship motion before firing the catapult.

**LOAD RANGE (Tire, etc.)** - The range of load over which a tire is capable of operating. For a tire, variation of loads would usually be accompanied by a proportional increase or decrease of inflation pressure within design limitations.

**LOAD, RATED (Tire, wheel, etc.)** - The specific load at which a tire (or wheel, etc.) is rated or qualified. For a tire, the rated load would be at a specific inflation pressure.

LOAD, RELEASE (A/V, Cat) - The maximum load applied to the aircraft holdback fitting by application of the catapult firing force in addition to the catapult tension load. The release load of predetermined magnitude ruptures a release element or disengages a repeatable release holdback bar, thereby allowing the aircraft to be released. See Reference (i).

LOAD REPETITION FACTOR (A/V, Base) - Sufficient passes of load carrying tires in adjacent tire paths to just cover a given width of pavement one time. The term is identical with "coverage" as used in pavement design.

LOAD, EQUIVALENT SINGLE WHEEL (A/V, Base) - The calculated load which, if applied to a single tire, would produce the same effect on the airfield as does the multiple wheel installation under consideration.

LOAD, SPEED, TIME CURVES (Tire) - Curves plotted against time which show the relationships of load and speed to time.

LOCKED WHEEL PROTECTION (B/C) - The temporary removal of brake pressure by a secondary control circuit while the controlled wheel(s) reaches a low predetermined wheel velocity when the aircraft is at a significantly higher velocity.

MAIN GEAR (L/G) - See GEAR, MAIN.

MAIN WHEEL STEERING (A/V) - The system, apparatus, and/or controls to facilitate maneuvering the aircraft on the ground by rotating some or all main wheels about an axis normal to the ground.

MAT, LANDING (Base) - See LANDING MAT.

METERED BRAKE PRESSURE (A/V, Brk) - The fluid pressure (usually hydraulic) which is metered to the brakes by pilot demand and control to provide the desired decelerating force for the aircraft.

METERING, PIN (S/A) - A pin within the shock absorber which operates through the fluid metering orifice as stroking occurs. Variation of the diameter of the pin or depth of axial grooves provides a preprogrammed metering of the fluid through the orifice to obtain maximum efficiency for a given landing condition and optimum balance of efficiency for all conditions.

METERING TUBE (S/A) - An arrangement within the shock absorber for metering fluid for control of energy absorption. The metering tube has drilled passages through the wall to program the metering of fluid as stroking occurs.

MODULATED BRAKE PRESSURE (A/V, B/C) - Metered brake pressure modulated by a skid control valve and control system.

MOLD SKID DEPTH (Tire) - The depth of the grooves in a tire mold, or conversely, the height of the tread on the tire. Variation in this parameter increases or decreases wear life of the tire. Tread depth may be limited by speed requirement and centrifugal force/stresses.

MOMENT OF INERTIA - See INERTIA.

MONO WHEEL (A/V) - An aircraft landing gear configuration in which there is a single wheel.

MOORING (Base) (A/V) - Tie-down or securing of the aircraft by cables, ropes, straps or chains for protection against wind, propeller or rotor wash, jet blast, ship motion, etc. Also called picketing. See Reference (k).

MULTIPLE WHEEL CONTROL (B/C) - Control of two or more braked wheels utilizing one valve and control circuit.

MULTI WHEEL (L/G) - Any landing gear assembly which utilizes two or more wheel assemblies. More appropriate for description of an aircraft or assembly with many wheels.

"MU" METER (Base) - An instrument, device, or apparatus for measuring the coefficient of friction of a runway surface under various conditions (damp, wet, flooded, icy, etc.).

NATURAL CONTOUR OF TIRE (Tire) - The uninflated tire cross-sectional contour.

NATURAL FREQUENCY (L/G) - The lowest frequency at which any structure or assembly will vibrate if disturbed from its normal position by external and upsetting forces.

NEGATIVE DAMPING (L/G) - (1) The opposite of damping. That is, the propagation of oscillations or disturbances. A buildup of energy with time. (2) Landing gear vibrations induced by the sensitivity of the torque developed between the rotating and non-rotating brake parts to slip velocity.

NEGATIVE FEEDBACK (B/C, etc.) - Feedback which results in decreasing the amplification.

NET PRESSURE (BRK) - Aircraft system pressure minus pressure required to overcome brake return spring load, seal drag, and auto adjusting load.

NOISE AND VIBRATION (Tire, L/G) - General term which covers such conditions as tire and wheel unbalanced vibration, tire tread pattern resonance, noise, etc.

NOSE GEAR (L/G) - See GEAR.

NOSE GEAR LAUNCH (A/V) - Launch of an aircraft by means of an apparatus including a launch bar attached to the nose gear and imparting tow loads to the aircraft through the nose gear system. See Reference (i).

NOSE WHEEL (L/G) - The wheel(s) designed for use on nose gears. They differ from main wheels in that they usually make no provision for brakes within the wheel. They are also designed to take the dynamic vertical loads resulting from brake drag loads applied at the main wheels.

NOSE WHEEL STEERING (A/V, NWS) - The system, apparatus, and/or controls for maneuvering the aircraft on the ground by rotating the nose wheels about an axis normal to the ground.

OLEO (S/A) (or Oleo Strut) - A telescoping landing gear strut consisting essentially of a piston that travels in an air-oil filled cylinder. The oil, upon compression of the strut, is forced through an orifice to provide a shock absorbing effect.

OLEO-PNEUMATIC (S/A) - See SHOCK ABSORBER, AIR-OIL.

ON-OFF SYSTEM (B/C) - A type of skid control system which utilizes a valve that opens or closes when the input signal exceeds or falls below specific threshold levels. Also called a "bang-bang" system.

OPEN LOOP (B/C, etc.) - A system operating without feedback, or with partial feedback. See CLOSED LOOP.

ORIFICE (S/A) - An opening, mouth, or vent. In a shock absorber, a hole through which oil is forced in the energy dissipation process.

ORIFICE COEFFICIENT (S/A) - A numerical constant defining the characteristic of a specific orifice.

ORIFICE CONTROL (S/A) - The method or process by which flow of oil through an orifice is controlled. That is, the variation of orifice area by metering pin, variation of orifice shape, etc.

OUTRIGGER GEAR (L/G) - See GEAR, OUTRIGGER.

OVERLAY PAVEMENT (Base) - A pavement which is laid on top of an existing pavement to increase the load carrying capability, repair, or seal the existing pavement. For instance, asphalt pavement laid on top of concrete or old asphalt.

OVERRUN (Base) - Extended clear area located at the end of a runway for the purpose of run out of an aircraft in an abort or emergency situation.

OVERRUN BARRIER (Base, A/G) - See BARRIER, OVERRUN.

PAIRED WHEEL CONTROL (B/C) - Control of two brakes/wheels utilizing one hydraulic antiskid valve and one control circuit.

PARABRAKE (A/V) - See DRAG CHUTE.

PARACHUTE (L/G) - Device used or intended to be used to retard the fall of a body or object through the air.

PARKING BRAKE (A/V) - The system and/or apparatus for applying brakes to park the aircraft for an extended length of time, including if the aircraft power is not available. Usually utilizes the same brake assemblies as for normal braking but with different control and power sources.

PARKING BRAKE COMMAND (Brk, A/V, B/C) – Parking brake command is the configuration to which the EMAs are commanded following a high energy stop associated with the parking brake applications used in the accelerate stop test and the most severe stop test. The parking brake command is not required to be equal to the maximum clamping load. In some applications, a switch or button may be used to initiate the Parking Brake Command.

PARKING VALVE (A/V, Brk) - The hydraulic valve which applies or blocks pressure to or from the brake assembly to maintain pressure for parking the aircraft.

PASS, AIRCRAFT (Base) - An aircraft passing a given station on a runway or taxiway; a takeoff and a landing constitute one pass for determining ground flotation capabilities.

PASS, GEAR (L/G, Base) - One movement of a gear assembly past a specific point on the runway or taxiway under consideration. (One aircraft pass may include more than one gear pass).

PAVEMENT, FLEXIBLE (Base) - Pavement of flexible construction, such as asphalt.

PAVEMENT, RIGID (Base) - Pavement of rigid construction such as concrete or steel reinforced concrete.

PEAK TO PEAK VALUE (B/C, etc.) - Of an oscillating quantity, the algebraic difference between the extremes of the quantity.

PENDANT, CATAPULT (Base, Cat) - A wire rope or synthetic fiber assembly designed to connect an aircraft to a catapult for the purpose of accelerating the aircraft for takeoff. The pendant connects to a single catapult hook on the aircraft and to the catapult shuttle spreader. The pendant falls off the aircraft (sheds) as it overtakes the shuttle and is generally restrained by a bridle arrestor system on the deck. Now obsolete in U.S. Navy due to introduction of nose gear launch, but may be still in use in some foreign navies. See also BRIDLE, CATAPULT.

PENDANT, CROSS DECK (Base, A/G) - See arresting cable.

PENDANT, HOLDBACK (Base) - A line or link assembly suspended from the aircraft to the deck fitting for holdback of the aircraft until the specified time for release for catapult, or to restrain the aircraft for engine runup.

PERCENT SLIP (Tire) - Percentage representing the ratio of reduction in wheel rotational velocity under the influence of braking force to the equivalent free rolling rotational velocity of an unbraked wheel.

PERFORMANCE INDEX (B/C) - Ratio (in percent) of time integral of instantaneous brake pressure divided by the time integral of a series of straight lines connecting the peak brake pressure levels during which skidding initiates.

PERIOD, NATURAL (L/G) - The reciprocal of the natural frequency of a landing gear. The time for one complete vibrational cycle in seconds.

**PHOTOELASTIC STRESS ANALYSIS (L/G)** - A visual full-field technique for measuring stresses in parts and structures. When a photoelastic material is subjected to forces and viewed under polarized light, the resulting stresses are seen as color fringe patterns. Interpretation of the colorful pattern will reveal the overall stress distribution, and accurate measurements can be made of the stress directions and magnitudes at any point. Three broad categories are embraced: (1) 2-dimensional model analysis, (2) 3-dimensional model analysis, and (3) photoelastic coating analysis.

**PICKETING (A/V)** - See MOORING.

**PISTON (Brk, S/A)** - A cylinder or disc that fits snugly into a larger cylinder and moves back and forth under fluid pressure.

**PITCH, AIRCRAFT (L/G, B/C)** - A porpoising motion of the entire aircraft under sudden braking or spoiler action. The effect of this motion is to pitch the aircraft forward and offload the braked landing gears, which reduces the traction available to the antiskid systems.

**PITCH, BOGIE (L/G, B/C)** - A porpoising motion of the bogie of a multi-axle gear relative to the aircraft.

**PIVOTING (A/V)** - The procedure or technique of turning an aircraft about a point such as about one main gear.

**PLANING MECHANISM (L/G)** - Mechanism installed on a landing gear which unlocks the wheel from the gear down and locked position and rotates it to a more favorable position for retraction clearance or stowage in the wheel well.

**PLY (TIRE)** - Layer of reinforcing cords that form the structure of the tire carcass.

**PLY RATING (Tire)** - A rating number which indicates the relative strength of a tire carcass. It is proportional to, but not necessarily the same as, the number of structural plies in the carcass. The actual number of plies in a tire carcass is usually less than the ply rating.

**PNEUDRAULIC (S/A)** - See SHOCK ABSORBER, AIR-OIL.

**PNEUMATIC CASTER (S/A)** - See TRAIL, PNEUMATIC.

**PONTOON (A/V)** - See FLOAT.

**POSITIVE FEEDBACK (B/C, etc.)** - Feedback which results in increasing the amplification.

**POST (S/A)** - A structural brace or member which supports the pivot point for the trailing arm of a levered suspension gear system.

**POWER ABSORPTION (Tire)** - The amount of power which is absorbed by the tire in the rolling process. It results in a temperature rise in the tire carcass.

**POWER LOSS (Tire)** - Power absorbed by the tires is a loss as far as useful work is concerned. See also POWER ABSORPTION.

**POWER RUN (Cat)** - That part of the launching run after release in which the applied catapult towing force is accelerating the aircraft.

**PRE-RETRACTED GEAR (L/G)** - A gear system which is not utilized in a takeoff mode and therefore is pre-retracted or placed in the stowed position. It is extended prior to landing the aircraft.

**PRE-ROTATION (Tire)** - The process of imparting rotation to the tires (wheels) prior to the landing touchdown to avoid the inertia loads on the gear imposed by rapid spin up and the wear on the tires caused by initial impact skidding.

PRESSURE EFFICIENCY (B/C) - The ratio of the measured brake pressure integral to the peak to peak straight line integral between the skid pressure levels from brake pressure time history instrumentation.

PRESSURE RISE (Tire) - The rise of inflation pressure in a tire due to brake heat and the rolling process, and the energy absorption and temperature rise associated with the process.

PRESSURE TRANSDUCER (B/C, etc.) - A transducer which produces an output proportional to the imparted pressure.

PROOF TEST (L/G, etc.) - A pressure test above normal operating pressure over a specific period of time for a shock absorber or other oil or air-oil unit to insure against seal leakage or structural weakness.

PROPORTIONAL CONTROL (B/C, etc.) - (1) Control of an aircraft, etc., in which control surface deflection (or output) is proportional to the movement of the remote control (or input). (2) A skid control type utilizing a valve which controls pressure in direct proportion to input current.

PROTECTOR PLY (TIRE) - Outer ply of tire carcass, sometimes made from steel, that provides cut protection for the tire carcass. See Figure 2.

PUCK (Brk) - A pad or cup which carries brake lining and is attached to the rotors and/or stators of the brake assembly.

QUADRILATERAL MECHANISM (L/G, etc.) - A mechanical linkage composed of four elements or links, one of which may be the fixed base of the mechanism. Widely used in landing gear retraction and folding systems. Also called a 4-bar linkage.

QUIESCENT FLOW (B/C, etc.) - A continuous leakage flow to return through hydraulic control interfaces.

RADIAL TIRE (Tire) - Pneumatic tire in which the ply cords that extend to the beads are laid substantially at 90 degrees relative to the centerline of the tire tread. Additional stabilization is provided by an essentially inextensible belt or belts in the tread region of the tire.

RADIUS OF GYRATION (Tire, etc.) - The moment of inertia of a solid body with respect to a given axis is the limit of the sum of the products of the masses of each of the elementary particles into which the body may be conceived to be divided and the square of their distance from the given axis.

If  $I = mK^2$  or  $K = \sqrt{\frac{I}{m}}$ , the quantity K is called the radius of gyration. Also called radius of inertia.

RADIUS ROD (L/G, etc.) - A rod or link in a mechanical system which serves to maintain a point in locus, equidistant from a given point. Used in landing gear retraction/extension system to predetermine and maintain the path of motion of the gear during the cycle.

RAM (L/G) - See ACTUATOR.

R.A.T.O. (ROCKET ASSISTED TAKEOFF) (A/V) - A system and/or installation on an aircraft or missile which utilizes a rocket motor assist during the launch or takeoff phase.

REACTION FACTOR (L/G) - See LOAD FACTOR.

REBOUND (S/A) - The phase of operation of a shock absorber after the compression and storing of energy within the unit. The stored energy forces the extension or rebound of the piston to release the energy. Sometimes causes the aircraft to bounce back into the air after initial impact unless the rebound is snubbed properly. Also called RECOIL or BOUNCE, AIRCRAFT.

RECOIL (S/A) - See REBOUND.

RECOIL CONTROL (S/A) - The process of control of the energy stored in a shock absorber after impact. The energy is dissipated in the extension phase usually by forcing hydraulic oil through orifices or passages.

RECOIL SNUBBER (S/A) - The valve, orifice(s), or snubbing device within a shock absorber which controls impact upon extension of the landing gear after takeoff or catapulting.

(RAST) RECOVERY, ASSIST, SECURE, AND TRAVERSE (A/V, Base) - A system, installed in the helicopter landing area of small ships, used to guide the helicopter to the landing area by means of a tensioned cable. Once landed, the helicopter is automatically secured to the deck. The system also assists in traversing the helicopter between the landing area and the hangar.

REJECTED TAKEOFF (RTO) (A/V) - The process of rejecting or aborting a takeoff of an aircraft because of engine or any other failure or command decision. This can be one of the critical design conditions for aircraft brakes. See also ABORT.

RELEASE (Cat) - (1) A device or catch for locking or releasing a mechanism. (2) The point in the launching operation at which the final tensioning process has been completed, the catapult fired, and the catapult tow force increased to such a magnitude as to rupture the release element or disengage the repeatable release holdback bar and affect release of the aircraft.

RELEASE ELEMENT (Cat) - The member in a catapult holdback which initiates the release process. Several types are (1) frangible link in the form of a tension bar or a tension ring which fails at a predetermined load, (2) hydromechanical device (repeatable release holdback bar), which releases at a given load and is reusable. The tension bar and tension ring are now obsolete and have been superseded by the repeatable release holdback bar.

REPEATABLE RELEASE HOLDBACK BAR (Cat) - A type of catapult holdback which is designed to restrain the aircraft until a predetermined load is built up in the towing mechanism, then release the aircraft automatically, allowing the aircraft to be launched. The reusable release element may then be reset for the next launch. See References (I), (j), and (l).

RESERVE ENERGY (S/A) - The capacity of a shock absorber to accept energy inputs over and above the design conditions; i.e., reserve for overload or over design landing conditions.

RESPONSE (L/G, B/C, etc.) - Of a device or system, the motion (or other output) resulting from a excitation or input under specified conditions. Response characteristics, often presented graphically, give the response as a function of some independent variable such as frequency or direction. For such purposes it is customary to assume the other characteristics of the input are held constant.

RESPONSE TIME (L/G, B/C, etc.) - The time delay between the application of an input signal and the resulting output signal.

RETRACTION (L/G) - (1) To draw back or in. (2) The process of lifting or folding a landing gear within the confines of the mold lines of the aircraft to a stowed position for high speed, low aerodynamic drag configuration of the aircraft.

RETRACTION CURVE (L/G) - A type of load-stroke curve which presents power requirements for the retraction cycle of operation for a landing gear.

RETRACTION GEOMETRY (L/G) - The geometric representation (mathematics) of the properties, measurement, and relationship of points, lines, angles, surfaces, and solids of component parts of a landing gear system in the retraction process.

REVERSE THRUST (A/V) - The force developed by an aircraft or a rocket engine in a reverse direction. This reverse thrust is utilized for deceleration of the aircraft in ground operations such as landing rollout or rejected takeoff to assist the wheels, brakes, and/or other systems of the aircraft.

RIGID PAVEMENT - See PAVEMENT.

**RIM WIDTH (Whl)** - The lateral dimension between the inside of the rim flanges of a wheel which restrain the installed tire in a lateral direction. Therefore, the rim width of the wheel is equal to the installed width across the tire beads.

**RING SPRING (S/A, etc.)** - A type of spring used in shock absorber design; circular split rings with a double trapezoidal cross section. The springs are utilized in stacks and absorb energy by friction of the adjacent ring surfaces when axial forces cause radial deflections.

**RISE TIME (B/C, etc.)** - The time required for the leading edge of a pulse to rise from one-tenth of its original value to nine-tenths of its final value. Rise Time is proportional to time constant. See also DECAY TIME.

**ROLL-OUT (A/V)** - (1) In the process of landing an aircraft, the time from touchdown through deceleration and stop: i.e., roll-out time, roll-out distance, etc. Also has other applications such as rejected take off from brake application to stop. (2) The first showing of a prototype.

**ROLL TEST (Wheel, Tire)** - A type of test for a wheel and/or tire which consists of a series of landings, takeoffs, taxis or a continuous roll of the tire/wheel assembly against a rotating flywheel. The test can be structured to be an index of the anticipated service fatigue life of the wheel or tire.

**ROLLER LANDING (A/V)** - A landing in which the main and nose wheels touch down on the runway but the airplane does not come to a stop before taking off again. See also TOUCH AND GO LANDING.

**ROLLING RADIUS** - See TIRE ROLLING RADIUS.

**ROLLING RESISTANCE** - See TIRE ROLLING RESISTANCE.

**RUNWAY (Base)** - (1) A path, channel, or track over which something runs. (2) A long and narrow prepared strip or piece of ground, usually hard surfaced, for the takeoff and landing of aircraft. The term "runway" is rarely applied to the flight deck of an aircraft carrier. The term is applied to water area or strips only in a general sense, as in "the natural runway provided by a river". See also "WATER LANE".

**RUNWAY, CONCRETE (Base)** - A runway surfaced with concrete, usually with steel reinforcement and gravel and/or broken rock sub layers.

**RUNWAY, POROUS ASPHALT (Base)** - A runway surfaced with porous asphalt materials, usually utilizing gravel and/or broken rock sub layers.

**RUNWAY, GROOVED (Base)** - A runway which has lateral grooves cut in the surface to provide for water drainage and the prevention of aircraft skidding or hydroplaning.

**RUNWAY LOADING INDEX (RLI) (Base)** - A factor which takes into account the runway load in terms of variations of pressure and single wheel load; it can be given with reasonable accuracy by the expression:  $R_{LI} = \sqrt{PW}$ , where: P = tire pressure and W = single wheel load.

**SAFETY CAGE (Tire)** - Structure designed to withstand inflated wheel/tire assembly burst forces.

**SATS (SHORT AIRFIELD FOR TACTICAL SUPPORT) (Base)** - An obsolete designation for a portable airfield design for use by a high-performance jet squadron. The field consists of a surfaced runway 2210 ft long and 96 ft wide, turn off areas at either end, a hot pad, and parking and maintenance. It also includes a CE1-3 catapult, two M-21 primary recovery systems, two Fresnel Lens Optical Landing Systems (FLOLS), and extensive field lighting and audio visual communications systems necessary to operate (launch and recovery) high performance jet aircraft. With deletion of the CE1-3 catapult about 1979, SATS airfields were redesignated Expeditionary Airfields.

**SELF BREAKING STRUT (L/G)** - A folding brace or strut in a landing gear system which carries its own actuator.

SEMI-ARTICULATED (L/G) - A variation on the articulated shock strut configuration. The wheel is mounted on a lever which pivots about the lower end of the piston of a telescoping shock absorber. The front end of the lever is restrained by a link to the outer cylinder of the shock absorber. See Figure 1. Also called SEMI-LEVERED.

SENSOR (B/C, etc.) - The component of a system that converts an input signal into a quantity which is measured by another part of the system. Also called Sensing Element.

SEPARATION (Tire) - A failure of interlaminar adhesion between ply layers and the surrounding rubber within a tire.

SEQUENCING (L/G, etc.) - (1) A following of one thing after another; an order of succession; a related or continuous series. (2) In landing gear system, the process of control of the gear retraction or extension in the proper order of succession. For example, when the gear control is placed in the gear "up" position (a) the wheel doors open, (b) the gear retracts within the wheel well and locks in the stowed position, (c) the doors close and lock, and (d) the system hydraulic pressure is deenergized, thus leaving the gear in position for high speed flight.

SERVICE PRESSURE (L/G, Tire) - (1) The pressure in a shock strut at time of servicing. The inflation pressure is a function of aircraft weight and is related to the piston stroke. The tire is usually inflated with dry nitrogen. (2) Inflation pressure needed to support the maximum operating load of a tire for a wheel position in the landing gear configuration. Service pressure is measured with the wheel/tire assembly under load.

SHIMMY (Wheel) - (1) Abnormal vibration or wobbling. (2) A self-sustained vibration of a rolling wheel(s) about a real or theoretical swiveling axis. Sometimes classified as large angle and small angle, in which large angle consists of more or less violent oscillations of the wheel assembly about its caster axis. The tire contact area is sliding bodily sideways at each swing and derives energy to maintain the oscillation from the forward motion of the vehicle. Small angle or Kinematic Shimmy is a high frequency oscillation within the adhesion range of the tire. (3) Sudden loss in directional stability by a landing gear system. It is characterized by uncommanded oscillations about the vertical axis. All components associated with the inner cylinder participate. Tires absorb and release the energy of the oscillations and maintain the event.

SHIMMY DAMPER (A/V, S/A) - Any of various devices attached to a castering wheel to damp oscillations about the castering axis. See also DAMPER.

SHOCK ABSORBER (A/V, S/A) - A device for absorbing the energy from impact of a mass or force input.

SHOCK ABSORBER, AIR-OIL (A/V, S/A) - A shock absorber which utilizes the principle of forcing oil through an orifice for absorption of energy, and also provides a chamber with gas (air or more commonly dry nitrogen) under pressure for the purpose of supporting the static load on the unit and by the gas pressure, extension of the shock absorber when the load is removed.

SHOCK ABSORBER, CONSTANT ORIFICE (A/V) - A shock absorber which utilizes a fixed or constant orifice in metering the fluid.

SHOCK ABSORBER, DASH POT (A/V) - A shock absorber which utilizes fluid metering for shock absorption, and does not provide a gas charge for maintaining a static load.

SHOCK ABSORBER, DUAL CHAMBER (A/V) - A shock absorber which provides two separate chambers for gas charge and thereby a two or three stage spring rate as the shock absorber is compressed.

SHOCK ABSORBER, FRANGIBLE (A/V) - A shock absorber which utilizes material failure as a shock absorption medium i.e., (a) buckling collapse of tubing, (b) fragmenting of tubing, (c) compression of honey comb material, (d) compression of a fluid filled device, and (e) compression of a solid thermoplastic. These devices are "one shot" devices and must be replaced after each use.

SHOCK ABSORBER, FRICTION (A/V) - A shock absorber which utilizes friction as the energy absorption medium such as a ring spring configuration.

**SHOCK ABSORBER, HONEYCOMB (A/V)** - A shock absorber which utilizes a crushable honeycomb core material as the shock absorbing element.

**SHOCK ABSORBER, LEAF SPRING (A/V, S/A)** - A shock absorber which utilizes the deflection of a leaf spring for energy absorption capability. Common on light aircraft.

**SHOCK ABSORBER, LIQUID SPRING (A/V, S/A)** - A shock absorber which utilizes the compressibility property of a liquid for the shock absorption medium. Generally provides a high spring rate short stroke, and requires special high pressure sealing techniques.

**SHOCK ABSORBER, PNEUMATIC (A/V, S/A)** - A shock absorber which utilizes air as the energy absorbing medium. Unusual on present day aircraft.

**SHOCK ABSORBER, RUBBER (A/V, S/A)** - A shock absorber which utilizes rubber as the shock absorption medium. May be used with or without oil damping.

**SHOCK ABSORBER, SPRING (A/V)** - A shock absorber which utilizes helical coil springs as shock absorbing elements. May be used with or without oil damping.

**SHOCK ABSORBER, VARIABLE ORIFICE (A/V, S/A)** - A shock absorber which utilizes a variable orifice for metering fluid which provides the shock absorption medium. The resistance or load on the unit can therefore be programmed versus stroke. A metering pin of variable diameter operating through the orifice is the most common method used for control. See also Metering Pin and Metering Tube.

**SHOCK CORD (S/A)** - A strong, many stranded, rubber cord encased in a braided fabric sheath, used as a shock absorber element on lightplanes or as a launching element for gliders. Also called BUNGEE.

**SHOCK STRUT (A/V, L/G)** - A structural strut or link which embodies a shock absorbing element.

**SHRINK LINK (L/G)** - A link or rod element of a landing gear system which during retraction provides a kinematic constraint and shrinks or shortens a shock strut to reduce the required stowage volume within the aircraft or vehicle.

**SHRINK STRUT (L/G)** - A strut which is shrunk or shortened before or during the retraction process to reduce the required stowage volume within the aircraft or vehicle. The shortening may be accomplished by means of a shrink link (kinematically), hydraulically, electrically, mechanically or by other methods.

**SHUT OFF VALVE (B/C, etc.)** - A device which is used to shut off or close down flow or pressure in a hydraulic or fluid system. Used in many landing gear system applications such as parking brake, skid control, etc.

**SHUTTLE (Cat)** - A device which moves back and forth. See also Catapult Shuttle.

**SHUTTLE VALVE (Brake, etc.)** - A valve used in a brake or other fluid power system which serves to shift from one power source to an alternate source, or for other similar applications.

**SIDE BRAKE (L/G)** - A brake which is mounted at the side of the wheel.

**SIDE FORCE COEFFICIENT (Tire)** - A mathematical (numerical) measure of the physical force property that is constant in determination of side force on a tire (perpendicular to the wheel plane).

**SIDEWALL (Tire)** - The rubber side area of the tire located between the shoulder and the beads that covers the underlying structure of the tire and protects the carcass from damage.

**SIDEWALL VENTS (Tire)** - Specific perforations in the lower sidewall of tubeless tires, usually located above the wheel rim centering rib, and defined by paint marks. These perforations release detrimental internal casing pressure.

**SINGLE WHEEL LOAD (SWL) (L/G)** - The share of the aircraft (or vehicle) or gear load as geometrically broken down and carried by a given wheel.

**SINK SPEED (A/V, L/G)** - (1) The rate at which an aircraft loses altitude. Especially, the rate at which a heavier-than-air aircraft descends in a glide in still air under given conditions of equilibrium. (2) The vertical sink rate at which an aircraft (i.e., landing gear) contacts the ground.

**SIPES (Tire)** - Lateral cuts in the tread of a tire. Under braking loads the tread sections deflect, thus exposing the cut edges and increase traction.

**SIZE FACTOR (Tire)** - A factor used in tire design to compensate for variation in characteristics due to size of the tire.

**SKID (L/G)** - A runner or slide used as an element of a landing gear of certain aircraft. See also WING SKID, TAIL SKID.

**SKID (Tire)** - (1) The act of sliding or slipping over a surface. (2) To slide without revolving, as a wheel. (3) Sometimes used to designate the portion of a tire tread which wears away in the normal service life of the tire; i.e. skid depth or mold skid depth.

**SKID CONTROL BOX (B/C)** - A component of the skid control system containing the electrical and electronic components (black box).

**SKID CONTROL SYSTEM (A/V, B/C)** - A group of interconnected components which interact to reduce excessive brake pressure (hydraulic brake system) or clamping force (electrical brake system) and thus prevent inadvertent or excessive tire skidding thereby contributing to shorter aircraft stopping distances. See also ANTISKID CONTROL

**SKID CONTROL VALVE (B/C)** - A component of the skid control system which modulates brake pressure in response to an electrical or mechanical signal from the skid control box.

**SKID DEPTH (Tire)** - The depth dimension of that part of a tire tread which wears away in the normal service life of a tire.

**SKID RESISTANCE (Tire)** - The physical characteristic of a tire to resist or oppose skidding. The characteristic is affected by inflation pressure, tire shape, tread pattern, and degree of wear, among other factors.

**SKIS (A/V, L/G)** - Long, flat runners attached to the landing gear of an aircraft for takeoff, landing, and operation over snow or ice; also, in special cases, over water.

**SLIP** - See WHEEL SLIP.

**SLIP RATIO** - See WHEEL SLIP RATIO.

**SLUSH DRAG (Tire)** - The drag or resistance to forward motion of a tire(s) and the aircraft which is generated as it moves through melting snow, slush and water.

**SNUBBER (L/G, A/G)** - A device which provides a resisting force to snub or damp an imposed load; i.e., arresting hook snubber which resists the upward force imposed by the carrier deck or ground, prevents hook bounce, and maintains point contact with the deck.

**SNUBBER VALVE (L/G, A/G)** - A device within a snubber which provides resistance to fluid motion and thereby snubs or damps the force imposed.

**SPEED BRAKE (A/V)** - An air brake in the form of a flap or plate, which when exposed to the airstream provides a decelerating force. Also called DRAG BRAKE.

**SPEED, CRITICAL ENGINE FAILURE (A/V)** - For a multi-engine aircraft, that speed at which during takeoff, the aircraft can fail the critical engine and (a) elect to continue takeoff and just clear the ground at the end of the runway or (b) elect to abort the takeoff and just stop the aircraft within the limit of the remaining runway.

**SPEED, DYNAMIC HYDROPLANING (A/V, Tire)** - The speed at which dynamic hydroplaning of a tire or complete aircraft occurs.

**SPEED, LANDING GEAR OPERATIONAL LIMIT (A/V)** - The maximum airspeed of the aircraft at which the landing gear is designed to retract and/or extend.

**SPEED, LANDING GEAR STRUCTURAL DESIGN (A/V)** - The maximum airspeed of the aircraft at which the landing gear may be exposed to the airstream without danger of structural damage.

**SPINDLE (L/G, etc.)** - An element of a landing gear which provides an axis for larger revolving parts.

**SPIN DOWN (Wheel, B/C, etc.)** - (1) The process of angular deceleration of the wheels of an aircraft after takeoff. (2) The decrease in angular velocity of a wheel as measured by the Skid Control System. Also noted as an increase in Slip Ratio.

**SPIN UP (L/G, B/C)** - (1) The process of accelerating the wheel of an aircraft from zero to high angular velocity in a very small increment of time at touchdown and contact with the runway which induces high drag loads in the landing gear structure. (2) Increase in angular velocity of a wheel (decrease in slip ratio) as measured by the Skid Control System.

**SPOILERS, GROUND (A/V)** - A type of drag brake and lift killing device designed to be operated after the aircraft has touched down on the runway. The intended purpose is to transfer the aircraft weight to the wheels as quickly as possible to enable braking and produce drag forces to decelerate the aircraft.

**SPRING BACK (L/G)** - A structural reaction in the landing gear system which follows spin up. The energy stored in the gear structure by spin up causes a cyclic reaction to produce forward drag forces in the system.

**SPRING RATE (L/G) (Tire, etc.)** - The force required to deflect a member a specified amount. Also Fore and Aft Spring Rate, Lateral Spring Rate, Torsional Spring Rate, etc.

**SPRUNG MASS (L/G)** - The portion of a landing gear which is attached to fixed aircraft structure as opposed to the unsprung mass (tires, wheels, brakes, axle, etc.), separated from the A/V by means of the shock absorber.

**SQUAT SWITCH (L/G)** - An electrical switch which is activated by virtue of presence of a load on the landing gear. This signal provides intelligence to many aircraft systems as to whether the A/C is airborne.

**SQUEAL (Brk)** - See BRAKE SQUEAL.

**STANDING WAVE (Tire)** - When a tire is operated at high speeds, the centrifugal forces, internal stresses, external loads, and deflections imposed result in a departure from a round shape. A Standing Wave builds up in front of and behind the contact area. This condition represents a dangerous mode of operation for the tire.

**STATIC LOAD (L/G, Tire, etc.)** - That load which is imposed on a member when in a static state or 1 g condition

**STATIC POSITION (L/G)** - The state of extension or compression of a landing gear when the aircraft is in a static or landing condition. Usually, further compression of the strut (taxi stroke) is available for dynamic taxi conditions. Decrease of the landing static load permits extension of the strut (landing stroke region) to the free flight or full extended position.

**STATIC STEERING TORQUE (NWS)** - The torque required to turn the nose wheel(s) of an aircraft as it sits static on the runway surface (without the benefit of engine thrust or forward motion of the aircraft).

STATIC TORQUE (Brk) - The torque which a brake is capable of resisting in a static (non rotating) state as opposed to dynamic torque.

STAY - See BRACE.

STEADY STATE RESPONSE TO STEERING (Tire) - The stable operating condition of a tire under lateral load inputs from the steering system.

STEER DAMPER (L/G) - A device which provides power for steering, usually on a nose gear, and also damping to resist shimmy.

STEERING ANGLE (L/G, Whl) - The angle through which the landing gear or wheel(s) may be steered. Usually expressed as degrees left and right (one half the total angle).

STRAIN IN CONTACT AREA (Tire) - The internal strain within the tire carcass in the contact area which is deflected from a normal state.

STRUT (L/G) - A structural support member for an aircraft for ground operation. Usually includes provisions for wheels, tires, axles, and shock absorber. Also, a bar or rod used to strengthen a framework by resisting longitudinal thrust.

SURGE (A/C, etc.) - A transient rise in power, pressure, etc., such as a brief rise in return pressure in a hydraulic system.

SWIVEL ANGLE (L/G, Whl) - The angle through which a gear or wheel is free to swivel or caster.

SUSPEND (Cat) - A halt in the process of attaching the aircraft to the catapult which results from the need to ascertain whether the launch can be safely accomplished. To permit evaluation of the situation, the catapult is placed in a safe condition by detensioning the catapult to disengage the bridle or launch bar from the catapult shuttle, and then moving the shuttle forward of the raised launch bar. If it is determined that the launch sequence can safely proceed, the catapult shuttle is again moved to battery position and the aircraft returned to the hookup condition for retensioning.

SYSTEM (A/V, L/G, etc.) - (1) Any organized arrangement in which each component part acts, reacts, or interacts in accordance with an overall design inherent in the arrangement. (2) Specifically, a major component of a given vehicle such as a Landing Gear System, or a Propulsion System. Usually called a major system to distinguish it from the systems subordinate or auxiliary to it.

SYSTEM, ARRESTING (A/V) - A system comprising the gear and apparatus designed to arrest the aircraft in its landing roll. See also Arresting Gear.

SYSTEM, BRAKE CONTROL (A/V, B/C) - A system comprising the gear and apparatus for decelerating the aircraft by means of wheel brakes and includes: control pedals or input, cable, mechanical or other connection to brake pressure metering valves, skid control valves and subsystem, wheel brakes and other elements.

SYSTEM, GEAR POSITIONING (A/V) - A system comprising the gear and apparatus for positioning the landing gear in its respective operational positions. Includes uplocks, downlocks, actuator, sequencing and indicating subsystems.

SYSTEM, LANDING IMPACT (A/V) - A system comprising the gear and apparatus for absorbing and dissipating the energy and loads imposed on the aircraft by impact with the ground.

SYSTEM, STEERING CONTROL (A/V) - A system comprising the gear and apparatus for steering the aircraft in ground operations. Includes an input control (wheel or rudder pedals) mechanical or electrical connection to power control valves, a power unit and other elements.

TAIL BUMPER (L/G) - A landing gear installation at the aft end of the fuselage or tail of the aircraft to protect it from contact with the ground. It may be a simple skid, a shock absorbing unit, or a complete retractable installation.